

Appendix A-

ASSETS AND FREIGHT FLOW TECHNICAL MEMO

Assets and Freight Flow

This technical memorandum provides an inventory of the existing freight assets and freight flows. The inventory includes all modes of freight transportation; highway, rail, air, water, and pipeline. It also includes an inventory of intermodal facilities where the different modes interact to exchange freight and the freight generators located within Missouri. For each of the modes of transportation a discussion of freight flows and forecasts is provided.

Introduction

Freight movement provides many economic benefits to the State through the shipment of parts to support production done in Missouri by Missouri workers, as well as, through the shipment of finished products moved both into and out of the State. The economic vitality of the State relies on transportation of goods into, out of, within, and to a lesser extent through Missouri to support jobs and growth throughout the State.

The production and transporting goods are key elements to the economic vitality of Missouri. The top ten occupations in Missouri for 2012 are shown in **Table A-1**. Two key occupations (Production and Transportation) are listed for 2012. Production is at number four with 188,170 employees and Transportation at number six with 176,490 employees.

Table A-1: 2012 Top Ten Occupations in Missouri

Top Ten Occupations in Missouri (2012)	
Occupation	Employees
Office and Administrative Support	434,790
Sales	264,150
Food Preparation	244,770
Production	188,170
Healthcare	179,390
Transportation	176,490
Education	150,510
Management	131,960
Financial	121,220
Installation and Maintenance	103,200

Source: U.S. Bureau of Labor Statistics

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As Missouri's population grows the demands for goods will follow, requiring more goods to be transported into or within the State. According to Woods and Poole Economic data in **Table A-2**, Missouri is expected to have an annual growth rate of 0.62 percent from 2012 to 2040. This results in over a million additional Missourians by 2040. The ten fastest growing counties by annual growth rate are shown in **Table A-2**.

Table A-2: Top 10 Fastest Growing Missouri Counties

Top 10 Fastest Growing Missouri Counties			
County	2012 Population	2040 Population	Annual Growth Rate
Christian	79,824	143,530	2.12%
Platte	92,054	163,260	2.07%
Cass	100,376	171,910	1.97%
Clay	227,577	358,420	1.64%
Boone	168,535	263,150	1.60%
Lincoln	53,354	79,870	1.45%
Newton	59,069	86,110	1.36%
Taney	52,956	76,300	1.31%
Greene	280,626	397,020	1.25%
St. Charles	368,666	517,450	1.22%

Source: Woods and Poole Economics

Missouri follows national trends of population growth in and around urban counties with less growth or negative growth in rural counties. By 2040, Missouri population is estimated to be over 7 million people. **Table A-3** shows the most populous counties are expected to include:

Table A-3: Highest Projected 2040 Population by County

Highest Projected 2040 Population by County			
County	2012 Population	2040 Population	Annual Growth Rate
St. Louis	1,000,438	1,050,850	0.18%
Jackson	677,377	682,610	0.03%
St. Charles	368,666	517,450	1.22%
Greene	280,626	397,020	1.25%
Clay	227,577	358,420	1.64%
Jefferson	220,209	295,380	1.05%
Boone	168,535	263,150	1.60%
St. Louis City	318,172	246,080	-0.91%
Cass	100,376	171,910	1.97%
Platte	92,054	163,260	2.07%

Source: Woods and Poole Economics

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Freight System Assets

This section provides an inventory of Missouri's major freight system assets for each mode of freight transportation, including highway, rail, air, water, and pipeline. In addition to the inventory for each mode, an inventory of intermodal facilities and freight generators is also provided.

Highway

Missouri has the seventh largest state highway system in the United States (U.S.). It is made up of 33,700 miles of roadway, 5,500 miles of which are classified as heavily traveled "major highways" and 28,200 miles of which are defined as lesser traveled "minor highways."¹ Missouri's major highways encompass just 20 percent of the state highway miles but carry 80 percent of the system's traffic. **Table A-4** lists the miles of Missouri's heavily traveled "major highways" by functional classification.

Table A-4: Miles of Missouri's Major Highways by Functional Classification

Miles of Missouri's Major Highways by Functional Classification

Functional Classification	Centerline Miles
Freeway	1,357
Interstate	1,385
Local	0
Major Collector	5
Minor Arterial	36
Principal Arterial	2,736
Total	5,519

Source: A Vision for Missouri's Transportation Future, MoDOT, 2014

National Highway System

The National Highway System (NHS) comprises approximately 160,000 miles of roadways important to the nation's economy, defense, and mobility.² The NHS was developed by the U.S. Department of Transportation in cooperation with states, municipalities, and metropolitan planning organizations (MPOs). The NHS includes the Interstate Highway System and the Strategic Highway Network (STRAHNET). The STRAHNET is a system of public highways that provides access, continuity, and emergency capabilities for military personnel and equipment. Other principal arterials and connector routes are also part of the NHS. In all, the NHS includes:

- Interstates
- Other principal arterials in rural and urban areas which support the interstate system by providing access to and from freight generators, major port, airport, public transportation facility, or other intermodal transportation facility
- The STRAHNET is a network of highways which have been identified as important for U.S. strategic defense policy
- Major strategic highway connectors which provide access between major military installations and the STRAHNET
- NHS designated intermodal connectors which provide access between major intermodal facilities and the NHS.

Figure A-1 shows the nearly 5,900 miles of NHS facilities in Missouri.

Interstate Highways

There are 18 Interstate Highways within Missouri, including nine main routes and nine auxiliary routes. These are listed in **Table A-5** and shown in **Figure A-1**. Interstate main routes are one or two digit numbered routes, while the auxiliary routes are three digit circumferential routes serving urban areas. The central location of Missouri benefits the transportation of freight as the interstate system located in Missouri provides national access to a vast majority of the nation. **Figure A-2** shows the national extent of the Interstates in Missouri.

¹ A Vision for Missouri's Transportation Future, MoDOT, 2014

² FHWA.com

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Interstate 29

I-29 is located within four States including Missouri, Iowa, South Dakota, and North Dakota. It is approximately 557 miles in length running from I-35/I-70 in Kansas City, Missouri to the Canadian border near Pembina, North Dakota, where it becomes Manitoba Highway 29 and connects to Winnipeg, Manitoba. I-29 connects to five major Interstates: I-70, I-35, I-80, I-90, and I-94.

Within Missouri, I-29 runs approximately 125 miles from its southern terminus at I-35/I-70 to the Iowa border. I-29 serves the metropolitan areas of Kansas City and St. Joseph.

Interstate 35

I-35 stretches from Laredo, Texas to Duluth, Minnesota, traversing a distance of roughly 1,570 miles. I-35 connects six states including Missouri. It is one of the most important freight corridors in the U.S. and provides access to North American Free Trade Agreement (NAFTA)-related international transborder freight at the Laredo, Texas port of entry. I-35 connects to 12 major Interstates: I-10, I-37, I-20, I-45, I-30, I-40, I-44, I-29, I-70, I-80, I-90, and I-94.

I-35 has a length of approximately 114 miles through Missouri, from the Kansas border at its southern terminus in Kansas City, Missouri to the Iowa border. Within Missouri, I-35 intersects I-670, I-70 and I-29. I-35 serves the metropolitan areas of Kansas City.

Interstate 44

I-44 is located within three states including Texas, Oklahoma and Missouri. It is approximately 633 miles in length running from Wichita Falls, Texas to St. Louis, Missouri. I-44 connects to five major Interstates: I-40, I-35, I-49, I-55, and I-70.

Within Missouri, I-44 runs approximately 290 miles from its southern terminus at the Oklahoma border to its eastern terminus at the Illinois border. I-44 serves the metropolitan areas of Joplin, Springfield, and St. Louis.

Interstate 49

I-49 is a Federal Highway Administration (FHWA)-designated High Priority Corridor and is currently located within two States, Louisiana and Missouri. Between Louisiana and Missouri, it runs through Arkansas, but is not designated as an interstate in Arkansas. Approximately 208 miles currently exists between Lafayette, Louisiana and Shreveport, Louisiana.

Within Missouri, I-49 runs approximately 180 miles from its southern terminus north of the Arkansas border to its northern terminus in Kansas City, Missouri. I-49 serves the Joplin and Kansas City metropolitan areas. Missouri's remaining section is the connection to the Bella Vista bypass.

Interstate 55

I-55 extends approximately 964 miles from I-12 in New Orleans, Louisiana to Chicago, Illinois. I-55 serves six states including Louisiana, Mississippi, Arkansas, Tennessee, Missouri, and Illinois. I-55 connects to 14 major Interstates: I-10, I-12, I-20, I-40, I-57, I-44, I-64, I-70, I-72, I-74, I-80, I-39, and I-90/94.

Within Missouri, I-55 runs approximately 210 miles from its southern terminus at the Arkansas border south of Sikeston to St. Louis. I-55 is the easternmost Interstate in Missouri. I-55 parallels the Mississippi River and serves Sikeston, Cape Girardeau, and the St. Louis metropolitan area.

Interstate 57

I-57 terminates at I-55 near Sikeston, Missouri. It runs approximately 386 miles from I-55 in Missouri to its northern terminus in Chicago, Illinois. I-57 connects to seven major Interstates: I-24, I-64, I-70, I-72, I-74, I-80, and I-94.

Within Missouri, I-57 runs approximately 22 miles from I-55 to the Illinois border. I-57 serves Sikeston.

Interstate 64

I-64 extends approximately 903 miles from Portsmouth, Virginia to I-70 at Wentzville, Missouri. I-64 serves six states including Virginia, West Virginia, Kentucky, Indiana, Illinois, and Missouri. I-64 connects to 12 major interstates: I-95, I-81, I-77, I-79, I-75, I-71, I-65, I-69, I-57, I-55, I-44, and I-70.

Within Missouri, I-64 runs approximately 40 miles from the Illinois border to its western terminus at I-70 in Wentzville. I-64 serves the St. Louis metropolitan area.

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Interstate 70

I-70 extends approximately 2,153 miles from near Baltimore, Maryland to Cove Fort, Utah. I-70 serves 10 States including Utah, Colorado, Kansas, Missouri, Illinois, Indiana, Ohio, West Virginia, Pennsylvania, and Maryland. I-70 connects to 20 major Interstates: I-68, I-81, I-99, I-79, I-76, I-77, I-71, I-75, I-74, I-69, I-65, I-57, I-55, I-64, I-44, I-35, I-29, I-25, I-76 and I-15.

Within Missouri, I-70 runs approximately 251 miles from the Illinois border in St. Louis to the Kansas border in Kansas City. I-70 connects the two largest metropolitan areas in Missouri, St. Louis and Kansas City. In addition, I-70 serves the Columbia metropolitan area.

Interstate 72

I-72 terminates at US-61 in Hannibal, Missouri. It runs approximately 180 miles from Hannibal, Missouri to its eastern terminus in Champaign-Urbana, Illinois. I-72 connects to two major Interstates: I-55 and I-57.

Within Missouri, I-72 runs approximately two miles from US-61 to the Illinois border. As part of a High Priority Corridor, it is possible that US-36 could be converted to interstate standards which would extend I-72 across Missouri to St. Joseph.

Interstate 155

I-155 is a freeway connection between I-55 near Caruthersville and I-69 in western Tennessee. It is approximately 11 miles in length.

Interstate 170

I-170 is the inner freeway connection between I-270 and I-64 in St. Louis and is approximately 11 miles in length.

Interstate 229

I-229 is the freeway loop serving St. Joseph and is approximately 15 miles in length. It connects to I-29 at both the northern and southern termini.

Interstate 255

I-255 is a partial freeway loop around St. Louis and is approximately four miles in length. It provides connections to I-55 and I-70 in Illinois.

Interstate 270

I-270 is a partial freeway loop around St. Louis. It runs approximately 36 miles from I-55, looping around the west and north sides of the St. Louis metropolitan area and enters Illinois.

Interstate 435

I-435 is a full freeway loop around Kansas City. It runs 56 miles in Missouri from the Kansas border/Missouri River north to I-29, travels generally east, turns south and turns back to the west and leaves Missouri at the Kansas border in the southern portion of the Kansas City metropolitan area.

Interstate 470

I-470 is a partial freeway loop in the Kansas City metropolitan area. It runs 17 miles from I-70 to I-435 in the southeast portion of Kansas City metropolitan area.

Interstate 635

I-635 is a freeway connector in the Kansas City area. It runs 13 miles from I-35 in Kansas to I-29 on the north. In Missouri, it runs approximately four miles between the Kansas border and I-29.

Interstate 670

I-670 is a freeway connector skirting the Kansas City, Missouri downtown area. It runs three miles from I-70 near the Kansas City downtown loop and reconnects to I-70 in Kansas. Approximately one mile of I-670 is in Missouri and connects to I-35.

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Figure A-1: Missouri National Highway System



Legend

USA Major Cities (1:500k-1m)

- 1,000,000 and greater
- 500,000 - 999,999
- 250,000 - 499,999
- 100,000 - 249,999
- 50,000 - 99,999

FHWA Intermodal Facilities

Eisenhower Interstate System

Other NHS Routes

Non-Interstate STRAHNET Route

Major STRAHNET Connector

Intermodal Connector

Intermodal/STRAHNET Connector

Unbuilt NHS Routes

MAP-21 Principal Arterials

Data Sources: USDOT FHWA, MoDOT, and ESRI

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Table A-5: Total Miles, Overlap Miles, and Major Cities Served by Missouri Interstate Highways



Legend	
Designated Truck Route	
	Federal Truck Route, Interstate Route
	Federal Truck Route, US Route
	State Truck Route, US Route
	Federal Truck Route, State Route
	State Truck Route, State Route
USA Major Cities (1:500k-1m)	
	1,000,000 and greater
	500,000 - 999,999
	250,000 - 499,999
	100,000 - 249,999
	50,000 - 99,999

Data Sources: MoDOT and ESRI

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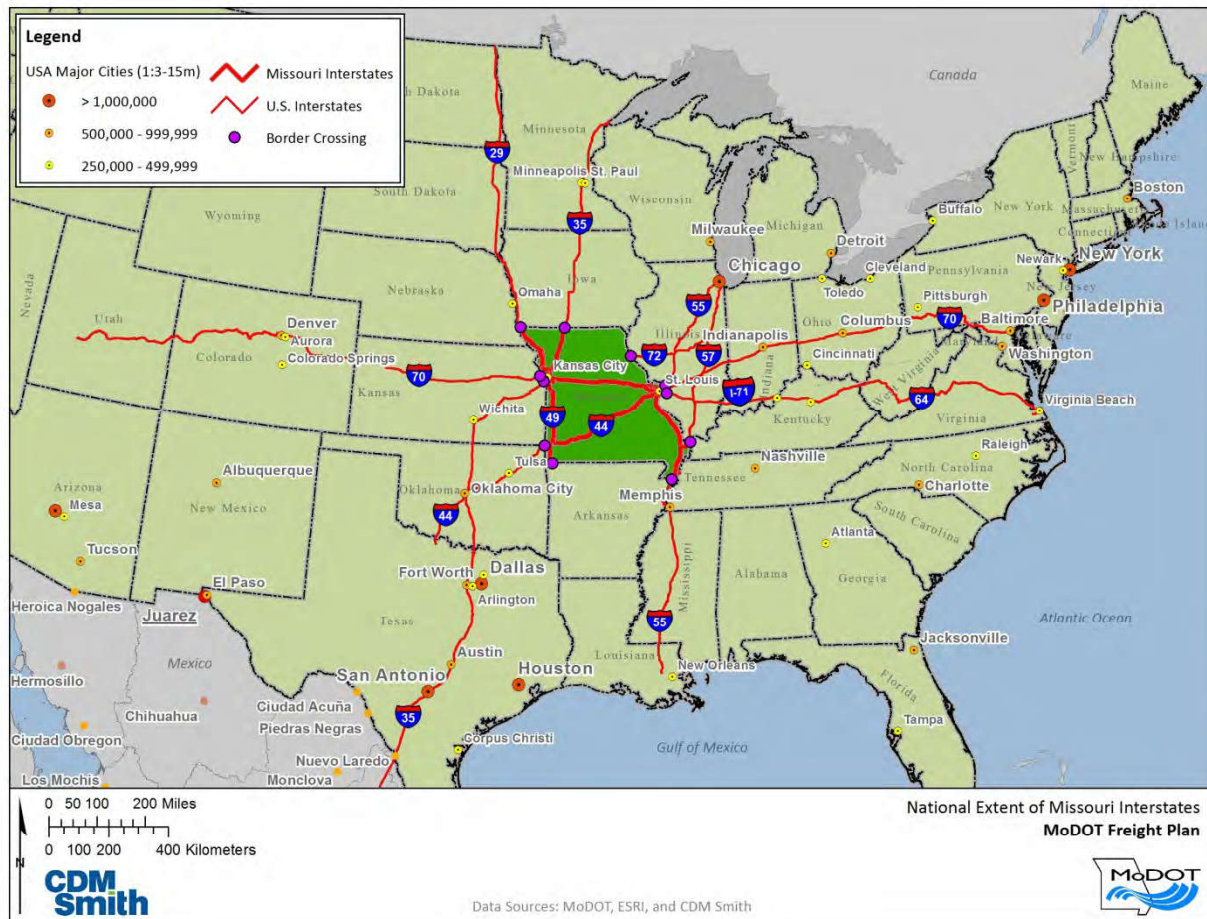
Missouri Interstate Highways

	Interstate Route	Total Miles	Overlap Miles	Route	Major Cities Served (population larger than 5,000)
Main Routes	I-29	125.22	5.5	I-35	Gladstone, St. Joseph, Kansas City
	I-35	113.74	1.0	I-70	Kansas City, Liberty
	I-44	290.49	-	-	Crestwood, Eureka, Kirkwood, Lebanon, Marshfield, Rolla, Shrewsbury, Springfield, St. Louis, Sunset Hills, Webster Groves, Wildwood
	I-49	178.96	-	-	Joplin, Kansas City
	I-55	209.45	1.0	I-44	Afton, Arnold, Barnhart, Cape Girardeau, East St. Louis, Festus, Lemay, Mehlville, Perryville, Sikeston
	I-57	21.96	-	-	Sikeston
	I-64	40.50	-	-	Brentwood, Chesterfield, Ladue, Lake St. Louis, O'Fallon, Richmond Heights, St. Louis, Town and Country, Wentzville
	I-70	251.66	-	-	Berkeley, Blue Springs, Boonville, Bridgeton, Columbia, Independence, Kansas City, Lake St. Louis, Maryland Heights, O'Fallon, St. Ann, St. Charles, St. Louis, St. Peters, Wentzville
	I-72	2.04	-	-	Hannibal
	I-155	10.84	-	-	Caruthersville
Auxiliary Routes	I-170	11.17	-	-	St. Louis, Hazelwood, Berkeley, Clayton, University City, Richmond Heights
	I-229	14.97	-	-	St. Joseph
	I-255	3.77	-	-	St. Louis
	I-270	35.62	-	-	St. Louis, Florissant, Ferguson, Bridgeton, Kirkwood
	I-435	52.78	-	-	Kansas City, Grandview, Raytown, Independence, Gladstone
	I-470	16.72	-	-	Kansas City, Lee's Summit, Independence
	I-635	3.77	-	-	Kansas City
	I-670	1.17	-	-	Kansas City
TOTAL		18	1384.83	7.5	
		Routes			

Sources: <http://www.fhwa.dot.gov/reports/routefinder/table1.cfm>, <http://www.fhwa.dot.gov/reports/routefinder/table2.cfm>, <http://www.fhwa.dot.gov/reports/routefinder/table3.cfm>

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Figure A-2: National Extent of Missouri Interstates



NHS Intermodal Connectors

“Intermodal connectors” are roadways that tie together the intermodal freight facilities to the national transportation system. Connectors link major freight activity nodes to arterial highway systems and improve the ability of networks to serve ports, rail yards, airports, and other freight intensive nodes efficiently. When designed, maintained, and operated with freight in mind, connector routes facilitate the best use of individual modes and improve the overall efficiency of regional highway networks. Designated NHS connectors are often referred to as the first and last miles of roadway used by truckers to travel between the major highways of the NHS and the nation’s ports, rail terminals, and air cargo hubs. A listing of Missouri’s currently designated NHS Intermodal Freight Connectors is included in Attachment A.

Missouri Major Highways

Figure A-3 depicts the Missouri major highway system which defines many of the paths on which freight moves. These major highways include Interstates, U.S. Highways, and most Missouri State Routes. The 28,200 miles of Missouri’s State highway system include lesser traveled “minor highways” that primarily serve local transportation needs. These roads consist mostly of lettered routes, which are often farm-to-market routes, serving as a vital link to the agricultural industry throughout the State.

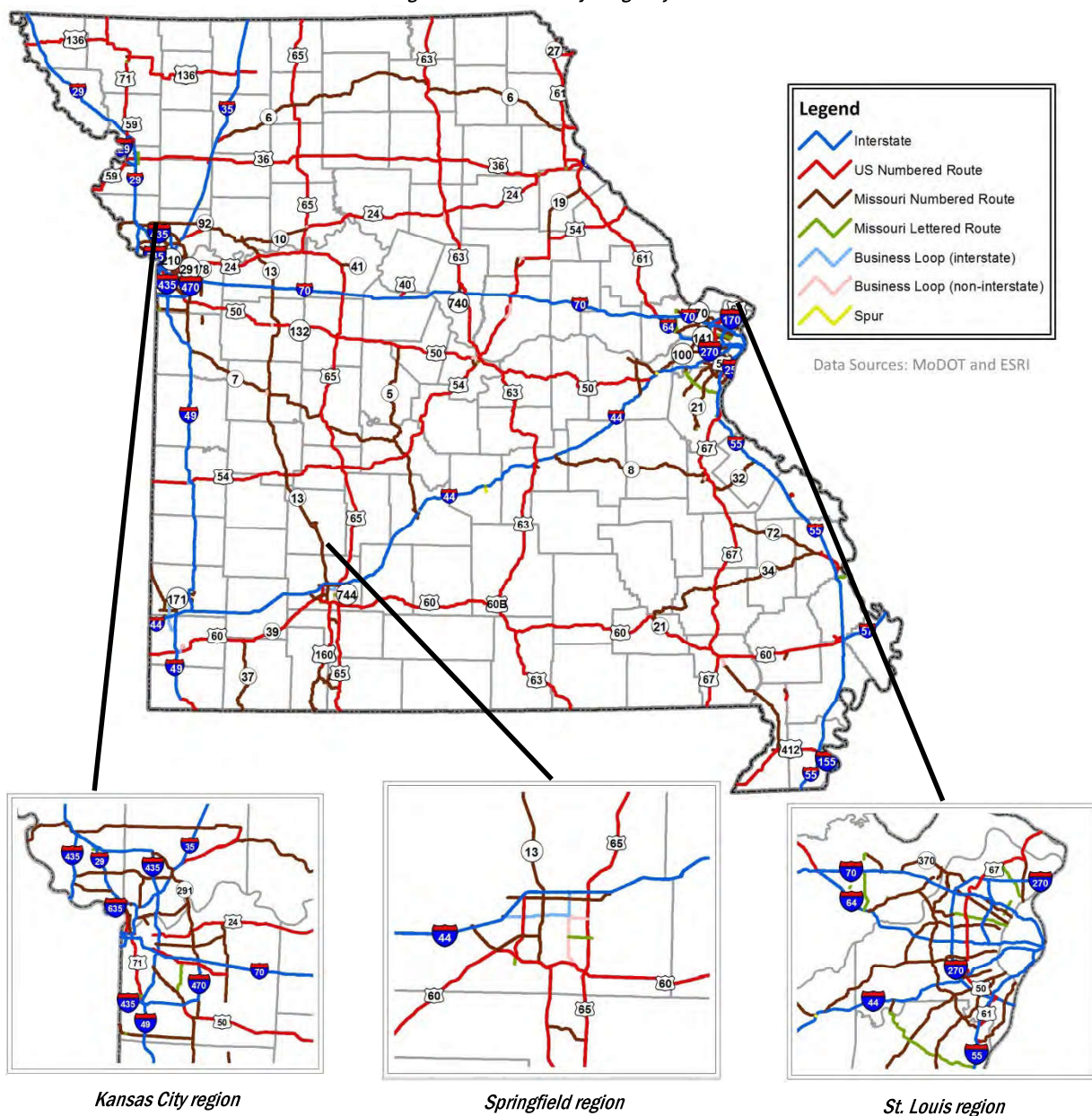
National Truck Network

In 1982 Congress passed the Surface Transportation Assistance Act (STAA), which imposed a federal 80,000 pound limit across the entire Interstate Highway Network. It also required states to allow these vehicles “reasonable access” to the National Network (or National Truck Network). The National Network includes Interstate highways and additional “Federal-Aid Primary”

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(FAP) roads that could safely accommodate STAA vehicles. The Missouri roadways which are designated on the National Truck Network are depicted in **Figure A-4**.³

Figure A-3: Missouri Major Highways



³www.fhwa.dot.gov

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Figure A-4: Missouri Truck Route System



Legend

Designated Truck Route

- Federal Truck Route, Interstate Route
- Federal Truck Route, US Route
- State Truck Route, US Route
- Federal Truck Route, State Route
- State Truck Route, State Route

USA Major Cities (1:500k-1m)

- 1,000,000 and greater
- 500,000 - 999,999
- 250,000 - 499,999
- 100,000 - 249,999
- 50,000 - 99,999

Data Sources: MoDOT and ESRI

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Rail

The rail industry classifies the freight rail network into three distinct operating categories: Class I, II, and III. The Missouri Freight Plan will utilize these classifications as the basis to define the rail assets within Missouri.

Railroad Classification

Railroad classification is determined by the U.S. Surface Transportation Board (STB) based on annual revenue dollars. In 2012 dollars, a railroad with operating revenues greater than \$433.2 million⁴ for at least three consecutive years is considered a Class I railroad. Similarly, a railroad with revenues greater than \$34.7 million⁵, but less than \$433.2 million⁶, is considered a Class II railroad; such railroads are commonly referred to as “regional” railroads.

A railroad not within the Class I or II categories is considered a Class III railroad, also known as a “short line”. As the name indicates, short lines operate over a relatively short distance. Short lines serve the larger railroads by collecting and distributing railcars to individual industrial and agricultural shippers and receivers. They provide a critical service, particularly in lower-density rail corridors and markets where the larger railroads cannot operate cost-effectively. From a historical standpoint, many of the nation’s short lines operate on branches previously owned and operated by the Class I railroads.

In addition, Missouri has eight switching and terminal railroads that move traffic between railroads, pickup/deliver rail cars at ports or industrial areas. These railroads provide connecting services to get freight to and from its ultimate origin or destination.

The following is a brief discussion of the freight railroads operating in Missouri as reported by the Association of American Railroads (AAR) as of June 2013.

Class I Railroads

Missouri has a significant freight rail infrastructure with six Class I freight railroads currently operating 4,218 miles of rail line within the State. **Table A-6** depicts the locations of the railroads within Missouri. **Figure A-5** shows railroad ownership in Missouri.

Table A-6: Miles of Class I Railroads in Missouri

Class I Railroads in Missouri	
	Miles Operated in Missouri
BNSF Railway Company	1,759
CSX Transportation	13
Kansas City Southern Railway Co.	396
Norfolk Southern Corporation	409
Soo Line Railroad Co. (Canadian Pacific)	144
Union Pacific Railroad Co.	1,497
Total Miles Operated by Class 1 Railroads	4,218

Source: Missouri State Rail Plan, MoDOT, 2012

Burlington Northern Santa Fe Railway Company (BNSF)

BNSF Railway operates one of North America’s largest railroad networks, serving the western two-thirds of the U.S. It employs more than 40,000 people and operates on 32,000 route miles stretching across 28 States and two Canadian provinces.

- Headquarters: Fort Worth, TX
- Total System Mileage: 32,000 (28 States and Canada)
- Commodities Hauled: Waste or scrap materials; farm products; chemicals or allied products; waste hazardous materials or waste hazardous substances; coal, lumber or wood products (excluding furniture); transportation equipment; petroleum or coal products; non-metallic minerals; primary metal products.

⁴ http://www.aslrra.org/about_aslrra/faqs/

⁵ http://www.aslrra.org/about_aslrra/faqs/

⁶ http://www.aslrra.org/about_aslrra/faqs/

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BNSF operates the most rail infrastructure in Missouri with major rail junctions in Kansas City, Bucklin, Monroe City, St. Louis, Cape Girardeau, Springfield, and Carthage.

CSX Transportation (CSX)

CSX Corporation and its rail and intermodal businesses provide traditional rail service and the transport of intermodal containers and trailers. Its network encompasses about 21,000 route miles of track in 23 States, the District of Columbia and the Canadian provinces of Ontario and Quebec. It serves all Atlantic and Gulf Coast ports, as well as the Mississippi River, the Great Lakes, the St. Lawrence Seaway and (through western railroad alliances) U.S. Pacific ports.⁷ The CSX transportation network serves some of the largest population centers in the nation. More than two-thirds of Americans live within CSX's service territory. The western terminus of the CSX network is in East St. Louis, Illinois. While CSX does not own any Missouri trackage, according to their 2010 R-1 Report⁸ to the STB the company operates on 13 miles in the State via trackage rights, secured through part ownership of the St. Louis Terminal Railroad Association (TRRA).

- Headquarters: Jacksonville, FL
- Total System Mileage: 21,000 (23 States, DC and Canada)
- Commodities Hauled: Freight of all kinds; electrical machinery; equipment, or supplies; waste or scrap materials; chemicals or allied products; waste hazardous materials or waste hazardous substances; food or kindred products

CSX Transportation serves the St. Louis metropolitan area providing rail connections to the east coast.

Kansas City Southern Railway Co. (KCS)

The Kansas City Southern (KCS) is a transportation holding company headquartered in Kansas City. Its North American holdings include the Kansas City Southern Railway Company (serving the central and south-central U.S.); Kansas City Southern de Mexico (serving northeastern and central Mexico and the port cities of Lázaro Cárdenas, Tampico and Veracruz); and a 50 percent interest in Panama Canal Railway Company (providing ocean-to-ocean freight and passenger service along the Panama Canal).⁹ KCS' North American rail holding and strategic alliances are primary components of a North American Free Trade Agreement (NAFTA) railway system, linking the commercial and industrial centers of the U.S., Mexico and Canada.¹⁰ According to its 2010 STB R-1 report, KCS owns 396 miles of track in Missouri and does not have any additional operational miles through trackage rights.¹¹

- Headquarters: Kansas City, MO
- Total System Mileage: 3,100 (10 States)
- Missouri Connecting Cities: Kansas City, Joplin
- Commodities Hauled: Farm products; lumber or wood products (excluding furniture); primary metal products; food or kindred products

KCS provides rail service to the north central and western regions of the State running through its corporate headquarters in Kansas City.

Norfolk Southern Corporation (NS)

Norfolk Southern Corporation (NS), through its Norfolk Southern Railway subsidiary, operates approximately 20,000 route miles in 22 States and the District of Columbia. NS serves every major container port in the eastern U.S. and operates the most extensive intermodal network in the East.¹² It is a major transporter of coal and industrial products and has major rail classification yards and intermodal terminals in Kansas City and St. Louis.

- Headquarters: Norfolk, VA
- Total System Mileage: 20,000 (22 States and DC)

⁷ <http://www.csx.com/index.cfm/about-csx/company-overview/>

⁸ Class I Railroad Annual Report to the Surface Transportation Board for the Year Ending December 31, 2010. CSX Transportation, Inc.

⁹ <http://www.kcsouthern.com/en-us/AboutKCS/Pages/AboutKCSMain.aspx>

¹⁰ <http://www.kcsouthern.com/en-us/AboutKCS/Pages/AboutKCSMain.aspx>

¹¹ Class I Railroad Annual Report to the Surface Transportation Board for the Year Ending December 31, 2010. Kansas City Southern Railway Company.

¹² <http://www.nscorp.com/nscportal/nscorp/Media/Corporate%20Profile/>

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- **Major Local Facilities:** Intermodal facilities located in Kansas City (Voltz Yard and Triple Crown Services Yard) and St. Louis (Luther Yard) and maintenance facilities in Kansas City, St. Louis, and Moberly
- **Commodities Hauled:** Agriculture; consumer and government; metals; construction; paper, clay and forest; chemicals; automotive; intermodal; coal; coke and iron ore

Norfolk Southern Corporation provides rail service through the north central region of the State, with major rail junctions in St. Louis, Monroe City, and Kansas City.

Soo Line Railroad Co. (CP)

The Canadian Pacific Railway (CP) operates on 14,800 miles of track in six Canadian provinces and 13 U.S. States. Kansas City is the southernmost point of the CP network. The Soo Line Railroad Co. is a Class 1 U.S. railroad, which is wholly owned by CP and does rail business under the CP name. The CP also operates the Dakota, Minnesota & Eastern Railroad Corporation (DM&E) and the Iowa, Chicago & Eastern (IC&E) Railroad.

IC&E territory covers 1,400 miles of track in Illinois, Iowa, Minnesota, Missouri, and Wisconsin. Its main lines extend from Chicago to Kansas City, and from Sabula, Iowa, along the Mississippi River northwesterly to the Minneapolis-St. Paul area, using trackage rights over the CP from La Crescent, Minnesota. Branch lines (known as the "Corn Lines") extend through Iowa from Marquette west to Mason City and Sheldon, and through Minnesota from Austin to Jackson and Rosemount.

- **U.S. Headquarters:** Minneapolis, MN
- **Total System Mileage:** 6,100 (18 States and provinces)
- **Missouri Connecting Cities:** Chillicothe
- **Major Local Facilities:** Kansas City, MO yard
- **Commodities Hauled:** Grains; automobiles; lumber; steel; chemicals

Missouri originated and destined cars handled in excess of 30,000 loads in 2011

The Canadian Pacific serves the Kansas City area providing rail connections to north central U.S. and Canada.

Union Pacific Railroad Co. (UP)

Union Pacific Railroad (UP) is an operating subsidiary of Union Pacific Corporation. Its operation covers 23 States in the western two-thirds of the U.S. The railroad links every major West Coast and Gulf Coast port and provides service to the east through its four major gateways in Chicago, St. Louis, Memphis and New Orleans. Additionally, Union Pacific operates key north/south corridors, serving all six major gateways to Mexico and interchanging traffic with the Canadian rail systems.

The rail system serves the country's fastest growing cities and states. UP serves the western coal reserves, Gulf Coast chemical industry and the rock quarries of south Texas. The railroad is the nation's largest hauler of chemicals and one of the largest intermodal carriers of truck trailers and marine containers. The railroad helps link production and consumption points in the U.S. and across the world, delivering energy, food, raw materials, durable and consumer goods to support the nation's growth.

The railroad has a diversified commodity mix, including chemicals, coal, food and food products, forest products, grain and grain products, intermodal, metals and minerals, and automobiles and parts. The largest of Union Pacific's 25,000 customers include steamship lines, vehicle manufacturers, agricultural companies, utilities, intermodal companies, and chemical manufacturers.

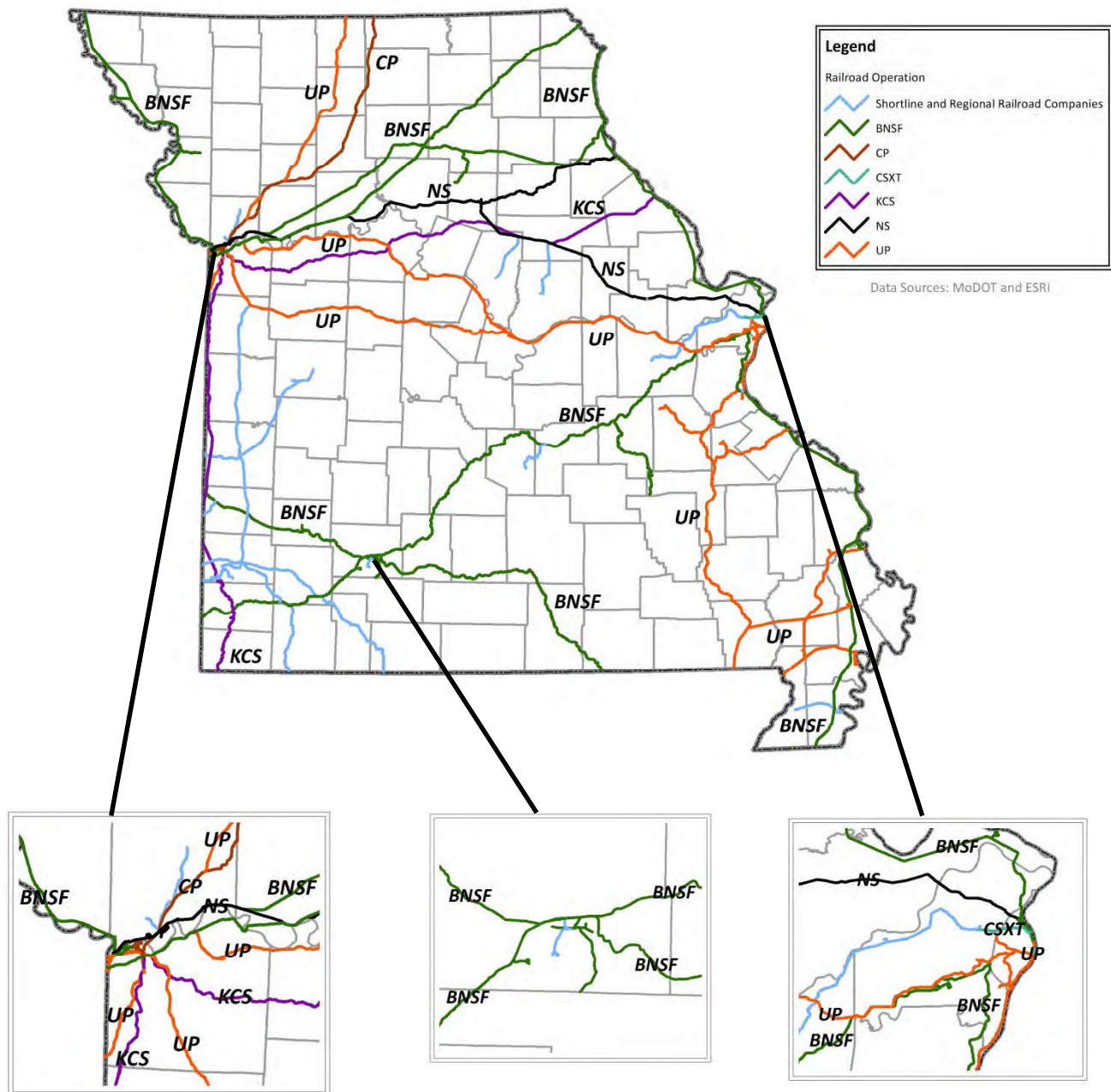
About 85 Union Pacific trains pass through Missouri daily. The UP facility in DeSoto, 40 miles south of St. Louis, is one of UP's three major freight car repair facilities. Kansas City is the site of a major UP freight classification yard, and the company operates terminals in St. Louis, Sedalia, Jefferson City, and Poplar Bluff. The UP also connects with four Missouri short line railroads: the Arkansas and Missouri, the Central Midland, the Missouri and Northern Arkansas, and the Semo Port. In 2010, UP handled more than 110,000 carloads originating from these short lines.

- **Headquarters:** Omaha, NE
- **Total System Mileage:** 32,000 (23 States in the western two-thirds of the U.S.)
- **Missouri Connecting Cities:** Kansas City, Columbia, Jefferson City, St. Louis, and Cape Girardeau
- **Major Local Facilities:** Kansas City and St. Louis
- **Commodities Hauled:** Chemicals; coal; food and food products; grain and grain products; intermodal metals and minerals; automobiles and parts

Appendix A: Assets and Freight Flow Technical Memo

Union Pacific Railroad serves the metropolitan areas of Kansas City, Jefferson City, St. Louis, Cape Girardeau, and Poplar Bluff.

Figure A-5: Railroad Ownership within Missouri



Appendix A: Assets and Freight Flow Technical Memo

Class II Railroads in Missouri

There are no Class II railroads operating in Missouri.

Short Lines (Class III Rail) in Missouri

Short line railroads connect Class I Railroads and commodity shippers and receivers. They often operate where it is not financially feasible for Class I Railroads to provide service. A total of five short line railroads, listed in **Table A-7**, serve Missouri. These systems include a total of 450 track miles, 426 within Missouri, ranging from 33 to 331 track miles per operator.

Table A-7: Miles of Short Line Railroads in Missouri

Short Line Railroads in Missouri	
	Miles Operated in Missouri
Arkansas & Missouri Railroad (AMR)	33
Kaw River Railroad (KRR)	21
Missouri & Northern Arkansas Railroad (MNA)	331
Ozark Valley Railroad, Inc. (OVR)	33
South Kansas & Oklahoma Railroad (SKO)	8
Total mile operated by Local / Short Line Railroads	426

Source: Missouri State Rail Plan, MoDOT, 2012

Switching and Terminal Railroads in Missouri

Switching and Terminal Railroads are Class III railroads engaged primarily in providing these services for other railroads (i.e., they are not typically involved in line-haul moves between two geographical locations). They are often categorized with short line railroads due to their operational and revenue characteristics, except in cases where they are owned by one or more Class I carriers. **Table A-8** lists the Switching and Terminal Railroads in Missouri.

Table A-8: Miles of Switching and Terminal Railroads in Missouri

Switching and Terminal Railroads in Missouri	
	Miles Operated in Missouri
Central Midland Railway	52
Columbia Terminal	22
Kansas City Terminal Railway Co.	32
Manufacturers Railway Co.	7
Missouri & Valley Park Railroad Corp.	27
Missouri North Central Railroad	4
SEMO Port Railroad, Inc.	8
Terminal Railroad Assn. of St. Louis	26
Total Miles Operated by Switching & Terminal Railroads	178

Source: Missouri State Rail Plan, MoDOT, 2012

Appendix A: Assets and Freight Flow Technical Memo

Central Midland Railway

Central Midland Railway (CMR) operates 42 miles of the former Rock Island line between Vigus and Union, Missouri. CMR interchanges with the TRRA at Lackland. CMR is contracted by Ameren Corporation to operate the line owned by Missouri Central. The remaining 213 miles of the Rock Island Line between Union and Pleasant Hill is out of service, but is not formally abandoned.¹³

Columbia Terminal Railroad

The Columbia Terminal Railroad (COLT) is a full-service short line rail, trucking, and storage network serving mid-Missouri. It is owned and operated by the City of Columbia, Missouri.

The COLT railroad operates on 22 miles of track running between Columbia and Centralia where the railroad interconnects with Norfolk Southern. Shippers located in the COLT area work directly with Norfolk Southern for car supply, tariffs, billing, collections and general marketing. COLT handles more than 1,500 cars annually and carries aggregates, automotive parts, chemicals, coal, forest products and scrap metals. The line is rated FRA Class II, which allows train speeds of 25mph.¹⁴

Kansas City Terminal Railway Company

The Kansas City Terminal Railway (KCT) is a joint operation of the trunk railroads in the Kansas City metropolitan area, the country's second-largest rail hub. It is the nation's largest terminal railway by gross ton and is presently operated by the Kaw River Railroad.

The railway owns and dispatches 100 miles of track (34 in Kansas and 66 in Missouri) and leases six locomotives. It serves the Class I railroads: BNSF, Kansas City Southern, Norfolk Southern Railway, Union Pacific and Canadian Pacific/Soo (formerly DM&E) and Class III railroads: Missouri and Northern Arkansas Railroad; and Amtrak.

Manufacturers Railway Co.

The Manufacturers Railway Company (MRS) located in St. Louis is owned by the Anheuser-Busch brewing company. Its 3.6-mile line connects with the TRRA in St. Louis. Through trackage rights over the company's line on the MacArthur Bridge, MRS connects with the Alton and Southern Railroad in East St. Louis, Illinois. In March 2011, Anheuser-Busch applied to the Surface Transportation Board to discontinue all service on the MRS after the brewery began shipping outbound products via truck instead of rail. However, Anheuser-Bush later announced it would transfer all rail switching services to Foster Townsend Rail Logistics, Inc. (FTRL Railway) to support St. Louis brewery operations after Manufacturers Railway ceases operation.¹⁵

Missouri & Valley Park Railroad Corp.

Effective January 30, 2011, Burlington Junction Railway began operations in Fenton on the Valley Park line. The railroad serves online customers and a transload site in Fenton. The MVP interchanges with BNSF and has the capacity to handle loads up to 286,000 pounds. Its transload facility is near I-44 and I-270 and has an outdoor yard ramp for machinery and equipment loading/unloading. The facility can handle bulk transfer, including food grade, and offers warehousing and boxcar unloading and loading.

Missouri North Central Railroad

The Missouri North Central Railroad (MNC) serves an industrial park in Chillicothe through a lease with the City. Operations began in 2004 over 37 miles of track from Brunswick to Chillicothe in Northwest Missouri. The line from Sumner to Brunswick was subsequently abandoned. The line interchanges with the CP/Soo line (formerly the IC&E/DM&E) in Chillicothe and with the BNSF in Brunswick.

Semo Port Railroad, Inc.

The Semo Port Railroad (SE) provides local switch service to the port facilities in Scott City and provides interchange connections with both the UP and BNSF. It does so by a six-mile Union Pacific branch line purchased in 1994 by the Semo Port. A one-mile extension to Semo Port's harbor industrial area was completed in 1995.

Motive Rail Corporation is the rail freight service contractor, providing transportation and other services to SE under contract. Commodities hauled by the Semo Port Railroad include aggregates, chemicals, food and feed products, and steel and scrap metal. At Cape Girardeau, Semo Port Railroad connects with BNSF's main line between St. Louis and Memphis. Through St.

¹³ http://www.progressiverail.com/where_we_go.html

¹⁴ www.gocolumbiainmo.com/WaterandLight/About_Us/COLT/

¹⁵ <http://www.ftrail.com/>

Appendix A: Assets and Freight Flow Technical Memo

Louis, the BNSF has routes to Chicago, St. Paul, Kansas City, Denver, and Seattle. Through Memphis, BNSF routes serve Birmingham, New Orleans, Houston, Dallas, California, and Mexico.

The SE's six-mile mainline is heavy welded rail (115 pounds and 133 pounds in curves). As a former UP branch, it handled heavy 100-car unit coal trains between southern Illinois and Missouri until 1990. The Harbor Lead track is 115 pound jointed rail. SE can handle 286,000- pound cars. Clearances allow movement of shipments handled on the main lines, including double-stack container cars.

At Capedeau Junction (east of Scott City), the Semo Port Railroad connects with UP's main line just west of the UP's double-track bridge over the Mississippi River.

Terminal Railroad Association of St. Louis

TRRA owns and operates the Merchants Bridge, the MacArthur Bridge, a rail switching facility in Madison, Illinois, and several key railroad routes in St. Louis, Missouri, and Madison and St. Clair Counties in Illinois.

The Merchants Bridge is a half-mile-long railroad-only bridge over the Mississippi River located just north of the downtown St. Louis area. Still a vital link in the company's operations, the Merchants Bridge was completed on March 18, 1890.

The MacArthur Bridge is part of a 6.2-mile-long elevated track crossing the Mississippi River in the heart of downtown St. Louis. The MacArthur Bridge and elevated track is the second-longest elevated steel structure across the Mississippi River. The MacArthur Bridge was originally constructed with a road deck over the rail deck; the bridge is currently used for railroad traffic only.

The company's rail switching yard in Madison, Illinois, is the largest such facility in the region. Approximately 30,000 cars pass through the company's switching facility on a monthly basis and are redirected to other destinations. The switching yard consists of 80 tracks (inbound, outbound and holding) with a capacity of 2,200 cars at any one time. The company operates 30 locomotives to move cars around the yard, deliver cars to local industries, and ready trains for departure.

Railroad Connectivity

Railroads provide important connections to water ports and intermodal terminals. Missouri is uniquely positioned with the Mississippi and Missouri Rivers providing rail access to ship and barge traffic. **Table A-9** lists the major Missouri water ports that have direct rail access and their connecting railroads. **Table A-10** lists the NHS Intermodal Connectors that connect to truck/rail intermodal facilities.

Table A-9: Major Missouri Water Ports with Direct Rail Access and their Connecting Railroads

Missouri Ports with Connecting Railroads		
Port	Location	Connecting Railroads
Pemiscot County Port Authority	Mississippi River between Hayti and Caruthersville	BNSF
SEMO Port, Southeast Missouri Regional Port Authority	Mississippi River at Scott City	UP and BNSF
New Madrid County Port Authority	Mississippi River 175 miles south of St. Louis	UP
St. Louis Municipal River Terminal	Mississippi River at St. Louis	BNSF, UP, NS and CSX
Kansas City Port Authority	Confluence of the Missouri and Kansas Rivers in Kansas City	UP

Source: Missouri State Rail Plan, MoDOT, 2012

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Table A-10: NHS Intermodal Connectors to Truck/Rail Facilities

NHS Intermodal Connectors to Truck/Rail Facilities	
Truck/Rail Facility	NHS Intermodal Connector Description
Burlington Northern, Kansas City	From I-29/35 (exit 6B): east 5.5 mi on Route 210 to facility entrance
Burlington Northern, Kansas City	From State Route 291: southwest 4.5 mi on Route 210 to facility entrance
Kansas City Southern, Kansas City	South on Chouteau Freeway from Route 210
Norfolk Southern/Triple Crown, Kansas City	From I-29/35 (exit 6B): east 5.5 mi on Route 210 to facility entrance
Norfolk Southern/Triple Crown, Kansas City	From State Route 291: southwest 4.5 mi on Route 210 to facility entrance
Norfolk Southern/Triple Crown, St. Louis	From, I-70 (exit 247); northeast 0.3 mi on Grand, northwest 1.5 on Hall to intermodal facility
Norfolk Southern/Triple Crown, St. Louis	From I-270 (exit 34); southwest 5.7 mi on Riverview Drive and continuing on Hall Street to terminal
Union Pacific, Kansas City	From Route 210 intermodal connector; south 2 mi on Chouteau Trafficway to facility entrance on Gardner Avenue

Source: FHWA

At-Grade Railroad Crossings

At-grade rail crossings present potential roadway safety and delay issues. There are over 5,600 at-grade railroad crossings within Missouri. **Table A-11** shows at-grade rail crossings by type, including freight railroad, Amtrak, and commuter rail operations. The intersection warning devices provided at those intersections are listed in **Table A-12**.

Appendix A: Assets and Freight Flow Technical Memo

Table A-11: Highway-Rail Grade Crossings by Type 2011

Highway-Rail Grade Crossings by Type 2011				
State	Total (number)	Public, motor vehicle (%)	Private, motor vehicle (%)	Pedestrian (%)
Missouri	5,697	60.3	38.9	0.8

Source: U.S. Department of Transportation, Federal Railroad Administration, Railroad Safety Statistics Preliminary Annual Report, table 9-2, available at safetydata.fra.dot.gov/OfficeofSafety/publicsite/Prelim.aspx as of April 2013.

Table A-12: Warning Devices at Public Highway-Rail Grade Crossings

Warning Devices at Public Highway-Rail Grade Crossings									
State	Total (number)	Cross bucks* (%)	Percent of Total						
			State (%)	Flashing lights (%)	Stop signs (%)	Unknown (%)	Special warning (%)	Highway Traffic Signals, Wigways, bells (%)	Other (%)
Missouri	3,436	46.1	26.5	19	3.3	2.7	1.4	1	0.1

Source: USDOT, Bureau of Transportation Statistics 2012

Water

Moving \$12.5 billion in cargo in 2012, Missouri waterways provide low-cost transportation benefits to businesses from around the globe. The Missouri and Mississippi Rivers are part of a large inland waterway network connecting 21 States with access through the Gulf of Mexico and the Great Lakes to the international maritime markets.

A previous collection of studies has been reviewed along with more recent data from TRANSEARCH on freight movements. Previous studies include: *Missouri Public Port Authorities: Assessment of Importance and Needs (2006)*, *Update of Missouri Public Port Authority Assessment (2007)*, *Freight Optimization and Development in Missouri: Ports and Waterways Module (2008)*, and the *Missouri River Freight Corridor Assessment and Development Plan (2011)*.

Missouri Waterways

Missouri sits in the heart of the Mississippi River Valley, with the Missouri and Illinois Rivers converging near St. Louis and the Ohio River converging at Cairo, Illinois, just across the Missouri stateline. Missouri contains approximately 1,050 miles of navigable rivers, including 500 miles of the Mississippi River, and 550 miles of the Missouri River. The Mississippi River is divided into the Upper Mississippi (860 miles) limited by a series of locks and dams and the Lower Mississippi (1,480 miles) with uninterrupted flow south to the Gulf of Mexico.

Public Ports

A total of 14 public port authorities and over 200 private ports can be found along Missouri's waterways. Three public port authorities and over 50 private ports operate along the Missouri River; 11 public port authorities and over 150 private ports operate on the Mississippi River. The 14 public port authorities occupy roughly 2,000 acres of land and currently report service to 36 counties and six other states.¹⁶

A Port Authority is the organizational and decision-making body that guides the development of public ports as established by the Missouri General Assembly. A Port Authority encourages economic development and job creation, approves any construction that may take place at the public port, prevents or removes obstructions in harbor areas, acquires right-of-way

¹⁶ Missouri Public Port Authorities: Assessment of Importance and Needs, 2006.

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within port districts, and disburses funds for activities, among other duties. There are different categories of public port authorities: active, inactive, and developing ports. There are six active public ports which have shipped product within the last year. There are three inactive public ports which have a public port facility but did not ship product within the last year. There are five developing public ports which currently do not have a public port facility. **Table A-13** lists the public port authorities and **Figure A-6** shows their locations.

Table A-13: Public Port Authorities status, location, and transportation access.

Public Port Authorities			
Port	Status	Location	Transportation Access
City of St. Louis Port Authority	Active	Mississippi River (mile 171.9 to 191.2)	Road: I-70, I-64, I-55, I-44; Rail: six Class I railroads; Air: two international airports; Pipeline: two major transcontinental
Howard/Cooper County Regional Port Authority	Inactive	Missouri River (mile 196.5)	Road: I-70, US-40 & 87, & MO-5; Rail: Union Pacific Railroad
Jefferson County Port Authority	Developing	Mississippi River (specific location to be determined)	Road: I-55 and US-61/67; Rail: Union Pacific & BNSF Railroads
Kansas City Port Authority	Inactive	Missouri River (mile 367.1)	Road: I-70, I-35, I-29 and US-71 (I-49); Rail: Union Pacific Railroad; Air: KCI & KC Municipal Airports
Lewis County-Canton Port Authority	Active	Mississippi River (Pool 21)	Road: US- 61; Rail: BNSF Railroad
Marion County Port Authority	Developing	Mississippi River (specific location to be determined)	Road: I-72, US-24, US-36, US- 61 Rail: BNSF Railroad, Norfolk Southern
Mississippi County Port Authority	Developing	Confluence of the Ohio and Mississippi Rivers (specific location to be determined)	Road: US-60
New Bourbon Regional Port Authority	Active	Mississippi River - Upper River mile 120.5	Road: US-61 & I-55; Rail: BNSF Railroad
New Madrid County Port Authority	Active	Mississippi River (885)	Road: I-55 Rail: Union Pacific Railroad
Pemiscot County Port Authority	Active	Mississippi River (849.9)	Road: I-55, I-155/US-412; Rail: BNSF Railroad
Pike/Lincoln County Port Authority	Developing	Mississippi River (specific location to be determined)	Road: US-61, 54 & MO-79; Rail: KC Southern and BNSF Railroad

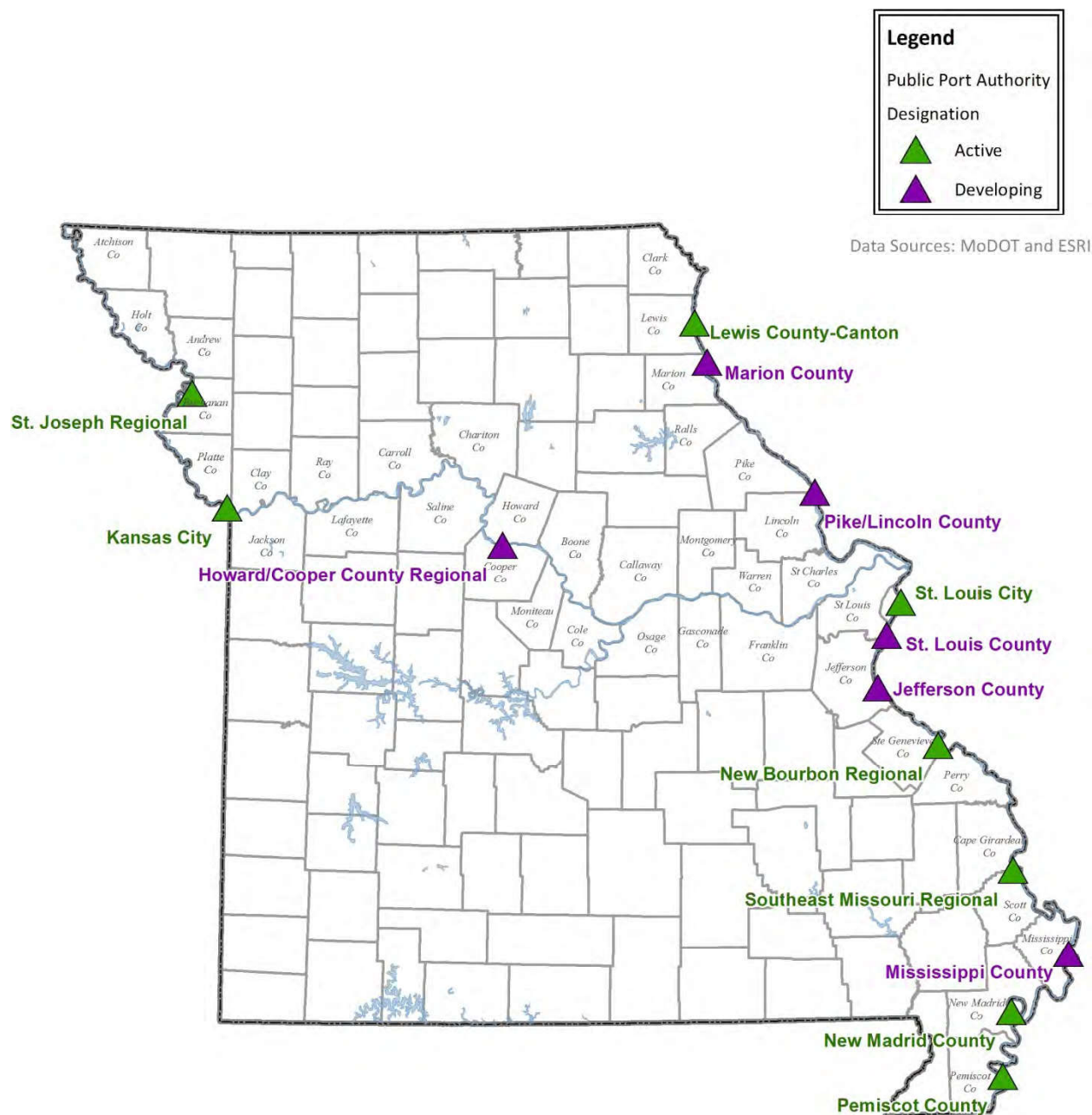
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SE Missouri Regional Port Authority	Active	Mississippi River (Upper River mile 48)	Road: I-55, I-57, I-24, I-64 & US-60; Rail: Union Pacific and BNSF Railroads
St. Joseph Regional Port Authority	Inactive	Missouri River (448)	Road: I-29, I-229 & US-36; Rail: Union Pacific and BNSF Railroads Air: St. Joseph Rosecrans Memorial Airport
St. Louis County Port Authority	Developing	Mississippi River (specific location to be determined)	Road: I-70, I-64, I-55, I-44; Rail: six Class I railroads; Air: two international airports; Pipeline: two major transcontinental

Source: <http://www.missouriports.org/index.html>

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Figure A-6: Public Port Authorities



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Active Public Ports

City of St. Louis Port Authority, Mississippi River

The City of St. Louis Port Authority (**Figure A-7**) has easy access to the Illinois River and the Missouri River as it sits at the intersection of U.S. Department of Transportation Marine Highways, M70 and M55. This is the second largest inland port by trip-ton miles, and third largest by tonnage.¹⁷ There are over 130 piers, wharves, docks, fleetings, and other facilities with 16 public terminals. Twenty-nine industrial

centers with a population of 90 million can be reached from St. Louis by barge. Industrial development sites are available in the City's 3000-acre North Riverfront Business Corridor.

Lewis County - Canton Port Authority

The Lewis County - Canton Port facility handles barge operations supporting grain, liquid fertilizer and dry bulk commodities.

New Bourbon Regional Port Authority

The Port of New Bourbon has barge access to Chicago, Memphis, Gulf Ports and ocean shipping services. There is transfer capability for inbound/outbound general cargo, aggregates and bulk commodities. The port can accommodate truck-to-barge/barge-to-truck transfers. There are building and storage sites available.

New Madrid County Port Authority

The Port of New Madrid County (**Figure A-8**) is located within the 4,200-acre St. Jude Industrial Park. This area is a designated Enterprise Zone. The facility is accessible by barge, truck and rail. Acreage is available for development within the industrial park.

Pemiscot County Port Authority

The Pemiscot County Port (**Figure A-9**) has transportation links to all surrounding cities, including St. Louis and Memphis. Forty-three percent of the total U.S. population and 42% of the total U.S. manufacturing establishments are within a two-day drive. There are 30 acres of port-owned building sites available. This area is a designated Enterprise Zone. Enhanced Enterprise Zones are specified geographic areas designated by local governments and certified by the Department of Economic Development. Zone designation is based on certain demographic

criteria, the potential to create sustainable jobs in a targeted industry, and a demonstrated impact on local industry cluster development.

Southeast Missouri (SEMO) Regional Port Authority

The SEMO Port (**Figure A-10**) handles general cargo, dry bulk commodities and project cargo. The port provides barge access to Gulf ports and worldwide open shipping services. Same day truck service is available to St. Louis, Nashville, Memphis, and Kansas City with next day truck service to Chicago, Atlanta, and Dallas. There is land available for development with existing leases on additional acreage.

Figure A-7: City of St. Louis Port Authority



Source: <http://www.missouriports.org/citystlouis.html>

Figure A-8: New Madrid County Port Authority



Source: <http://www.missouriports.org/madrid.html>

Figure A-9: Pemiscot County Port Authority



Source: <http://www.missouriports.org/pemiscot.html>

Figure A-10 Southeast Missouri (SEMO) Regional Port Authority



Source: <http://www.missouriports.org/southeast.html>

¹⁷ <http://www.missouriports.org/citystlouis.html>

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Inactive Public Ports

Howard/Cooper County Regional Port Authority

The Howard/Cooper County Regional Port Authority (**Figure A-11**) is the only public shipping access between Kansas City and St. Louis. There are no locks or dams obstructing the channel of the Missouri River from this site to its junction with the Mississippi River in St. Louis. There is capacity for grain, liquid chemicals, and dry storage. Thirty-five prime industrial acres are available for development. Currently this Port is considered inactive.

Kansas City Port Authority

The Kansas City Port Authority is one of the largest storage and distribution centers serving the Missouri River. This is a true intermodal facility, transferring product between barge, rail, and truck. The terminal effectively serves any area within a 200-mile radius of Kansas City, Missouri. There are 145 acres available for industrial or retail development. This Port is currently categorized as inactive.

St. Joseph Regional Port Authority

The St. Joseph Regional Port Authority (**Figure A-12**) is located 50 minutes from downtown Kansas City, MO, and two hours from Omaha, NE. This location is within 500 miles of 43 percent of the U.S. Population and 44 percent of the U.S. manufacturing establishments. There is potential for industrial development with 31 acres in redeveloped Stockyards Industrial Park, minutes south of the park on MO-759. The Port is currently considered inactive.

Figure A-11: Howard/Cooper County Regional Port Authority



Source: Missouri Public Port Authorities: Assessment of Importance and Needs

Figure A-12: St. Joseph Regional Port Authority



Source: <http://www.missouriports.org/stjoseph.html>

Developing Public Port Authorities

Jefferson County Port Authority

Jefferson County does not currently have a port facility. The objective of the port authority has been to buy land and develop a port in the near future. The location of Jefferson County is prime for waterway development due to the long Mississippi River border and intermodal access near the river. The port site is undeveloped today and lacks adequate highway infrastructure suitable for a port or any commercial development.

Marion County Port Authority

Marion County Port Authority plans have included building a port to support development of an ethanol plant on site, adding a biofuel plant and developing new intermodal capabilities for Container-on-Vessel (COV).

Mississippi County Port Authority

The location of the Mississippi County Port (**Figure A-13**) allows year-round access for barge operators as the northern-most ice-free area on the Mississippi. Vehicle ferry service operates seven days a week on a continuous basis from Dorena, Missouri to Hickman, Kentucky. The port authority is situated on 18 acres with nearly 1,900 feet of river frontage. Currently Mississippi County Port falls into the developing category.

Figure A-13: Mississippi County Port Authority



Source: <http://www.missouriports.org/mississippi.html>

Appendix A: Assets and Freight Flow Technical Memo

Pike/Lincoln County Port Authority

The Pike and Lincoln County port is a developing port with barge service provided via the Mississippi River. Many existing businesses already take advantage of this form of transportation to distribute their products and bring in raw materials. There is currently no port at this location.

St. Louis County Port Authority

Efforts to bring commercial uses to the St. Louis County Port Authority site have not succeeded due to extensive remediation, lack of flood protection, and limited access to other transportation modes. Some work has been done to improve access issues. The port is considered developing at this time.

Private Ports

There are over 200 private ports in Missouri that include marinas and docks that directly connect businesses to waterways. While these are obviously important to Missouri, they do not receive funding from MoDOT's multimodal section, and were considered beyond the scope of this study.

Locks & Dams

The lock and dam system, under the jurisdiction of the U.S. Army Corps of Engineers, was implemented to control the river levels and provide more reliable navigation. The seven locks and dams adjacent to Missouri, listed in **Table A-14**, are part of the Upper Mississippi River starting just north of St. Louis to the Iowa border. The Lower Mississippi River (south of St. Louis) and the Missouri River contain no locks or dams.

Table A-14: Listing and Location of Locks and Dams Adjacent to Missouri

Missouri's Locks and Dams	
Lock/Dam Number	Location
No. 20	Canton, MO
No. 21	Quincy, IL
No. 22	Saverton, MO
No. 24	Clarksville, MO
No. 25	Winfield, MO
No. 26 (Melvin Price)	East Alton, IL
No. 27 (Chain of Rocks Dam)	Glasgow Village, MO
No. 27 (Chain of Rocks Lock)	Granite City, IL

Source: U.S.. Army Corps of Engineers

Maritime Highways

Since 2009, the U.S. Department of Transportation has designated several marine highways for transporting cargo on water, reducing pollution and congestion on roads. Designated marine highways receive preferential treatment for federal assistance from the U.S. Maritime Administration (MARAD). Maritime highways serving Missouri include M-29 covering the Upper Missouri River from Kansas City to Sioux City, Iowa; M-70 covering the Missouri River from Kansas City to St. Louis; M-35 from St. Louis to the Twin Cities, and M-55 covering the Mississippi River from St. Louis to the Gulf of Mexico and from St. Louis to Chicago.

Air

The Federal Aviation Administration (FAA) categorizes public use airports into the following categories: Primary Commercial Service Airports, Non-primary Commercial Service Airports, Reliever Airports, and General Aviation Airports. Primary Commercial Service Airports are further broken down into subcategories of Large Hub, Medium Hub, Small Hub, and Non-hub depending on their percentage of total U.S. passenger enplanements. Commercial Service Airports are those with at least 2,500 annual passenger enplanements and regularly scheduled commercial airline traffic.¹⁸

¹⁸ http://www.faa.gov/airports/planning_capacity/passenger_allcargo_stats/categories/

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The quantity of air cargo moving between origin and destination points, and also the amount of cargo transferring via an airport, is closely related to airport infrastructure capacity. Missouri's busiest cargo airports are located near major metropolitan areas that produce consistent passenger and air cargo traffic. Consequently, these facilities must be able to support large aircraft capable of accommodating market demand. The State's smaller airports, generally located near Missouri's medium-sized metro areas, generally have infrastructure capable of supporting smaller-scale air cargo operations. These airports can be used to move cargo traffic to larger airports and airports outside of the State.

The movement of air cargo takes place via one of three types of carriers: all-cargo, integrated express, or on passenger airlines as belly cargo. Integrated express operators rely on a hub-and-spoke system to move the customer's goods door-to-door, providing shipment, collection, transport via air/truck, and delivery. Integrated express operators include FedEx Express, UPS, and formerly DHL (domestic pickup and delivery service discontinued in January 2009). All-cargo carriers operate airport-to-airport freight services for their customers but do not offer passenger service. All-cargo carriers include China Cargo, Capital Cargo International, USA Jet Airlines, and Kalitta Charters, to name a few. Internationally, Aeromexico, Air Canada, Air Transport International, United Cargo and Volga-Dnepr Airlines are passenger airlines with their own fleet of dedicated freighter aircraft. All-cargo carriers offer scheduled service to major markets throughout the world using wide body and/or containerized cargo aircraft. Air cargo services, or "belly cargo," provided by passenger airlines vary in scope and size from airline to airline, based on differences in aircraft operating fleet. A regional airline with a fleet of turboprop and regional jets cannot accommodate bulky cargo. Airlines operating wide body aircraft have containerized lower decks and are capable of handling large shipments. These air cargo networks are supplemented in the air by regional/feeder airlines and on the ground by freight forwarders/road feeder service (RFS) trucking companies.

Air cargo is typically lightweight, time-sensitive, and high-value. Common examples of air freight include perishables (flowers, fish, produce), computers and peripherals, telecommunications equipment, vehicle parts, oil and gas drilling equipment, pharmaceuticals, clothing, medical supplies and equipment, beauty supplies, as well as many others. It is impossible to know exactly what items are shipped as this information is not published by carriers. An aircraft may have a wide-ranging mixture of any of the above items on board. Assumptions can be made based on the economies of the markets being served; however, any assumptions would be speculative. Missouri is home to three of the top 110 cargo airports in North America in terms of total tonnage in 2012 listed in **Table A-15** and shown in **Figure A-14**.

Table A-15: Missouri's Top Freight Airports Listing, Location, 2001 and 2013 Cargo Tonnage and Ranks

Missouri's Top Freight Airports							
ID	Airport Name	Associated City	2001 Total Cargo Tonnage	2013 Total Cargo Tonnage	2001-2013 CAGR*	North American Rank 2013	Global Rank 2013
MCI	Kansas City International Airport	Kansas City	142,563	99,354	-2.96%	37th	152nd
STL	Lambert - St. Louis International Airport	St. Louis	122,184	64,557	-5.18%	56th	N/A
SGF	Springfield-Branson National Airport	Springfield	11,337	12,693	0.95%	106th	N/A

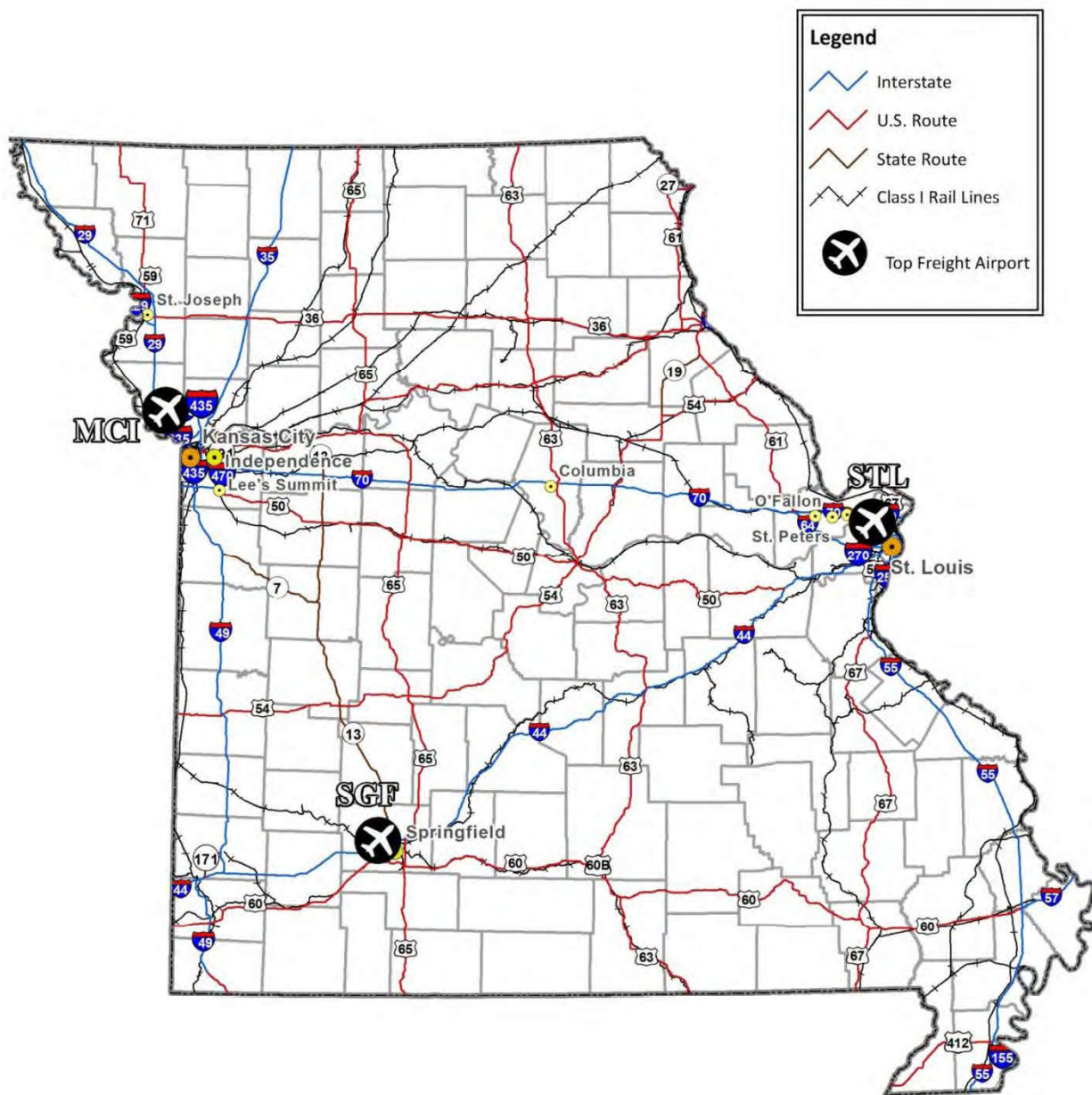
Source: Airport Council International - North America (ACI-NA)

**CAGR = Compound Annual Growth Rate*

These three airports handled nearly 177,000 tons of total air cargo in 2013, which represents a decrease of 3.7 percent annually since 2001. In this same time frame, Missouri's fastest growing airport by total tonnage was Springfield-Branson National (SGF) at 0.95 percent annually. Kansas City International and Lambert - St. Louis International both experienced losses in total air cargo from 2001-2013. These airports handling freight are discussed in this section.

Appendix A: Assets and Freight Flow Technical Memo

Figure A-14: Missouri's Top Freight Airports



Connections between the cargo airports and the highway networks are integral to the movement of freight from these gateways. **Table A-16** identifies the Interstate Highways that are within 90 miles of these major air cargo airports in Missouri.

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Table A-16: Interstates in Proximity (within 90 miles) to Cargo Airports.

Interstates in Proximity to Cargo Airports			
Interstates	MCI	STL	SGH
I-29	X		
I-35	X		
I-44		X	X
I-49	X		X
I-55		X	
I-64		X	
I-70	X	X	
I-170		X	
I-255		X	
I-270		X	
I-435	X		
I-470	X		
I-635	X		
I-670	X		

Source: CDM Smith

Kansas City International

Kansas City International (MCI) is the primary airport serving the Kansas City metropolitan area. Located approximately 15 miles north of downtown Kansas City, MCI has three runways ranging from 9,500 feet to 10,801 feet. It is the busiest airport in Missouri regarding annual air cargo tonnage and moves more air cargo each year than any air center in a six-state region. In 2013, 99,354 tons of freight and mail passed through MCI, which ranks 37th in the U.S./North America and 152nd globally.

Air carriers benefit from many of MCI's competitive advantages such as direct highway access, central North American location, 252,000 square feet of cargo warehouse space, 1.27 million square feet of apron area, and three runways. In addition, MCI has a U.S. Postal Service (USPS) facility with airside access, as well as an on-airport trucking terminal that provides another 30,000 square feet of warehouse.

FedEx has been MCI's largest cargo carrier (in annual volume) every year since 1995. The FedEx development was financed with \$10.5 million of bonds issued by the Industrial Development Authority of Kansas City, Missouri. In 1997, FedEx completed an 85,000-square-foot regional hub building at MCI that is capable of handling 6,000 packages per hour. The facility is designed to accommodate two wide body and four narrow body aircraft in its current configuration.

MCI encompasses 10,200 acres of land with a large area designated for cargo facilities. All-cargo carriers at MCI include DB Schenker, DHL, FedEx, and UPS. These carriers represent flights from MCI, to markets throughout North America and Canada. KCI's concentrated landside cargo facilities are well-served for aviation and trucking resources, all accessible by Mexico City Avenue. Mexico City Avenue functions as a "designated cargo road", which has its own connection to I-29, thereby segregating the truck traffic from passenger traffic. Mexico City Avenue is classified as a four-lane principal arterial with a standard capacity of up to 24,000 vehicles per day. According to traffic counts recorded in spring 2007 at Mexico City Avenue between Prairie View Road and Paris Street, there are approximately 8,200 vehicles traveling on Mexico City Avenue per day.

In addition to the cargo carriers at MCI, numerous passenger airlines provide cargo lift capacity on routes operated with wide-body passenger aircraft. These aircraft have space designed to hold cargo containers in the belly of the aircraft and serve international destinations in Canada and Mexico. MCI is a major hub for Southwest Airlines, which provides service to numerous domestic and international cities. Kansas City International's domestic and international air cargo routes are illustrated in Table A-17 and Figure A-16.

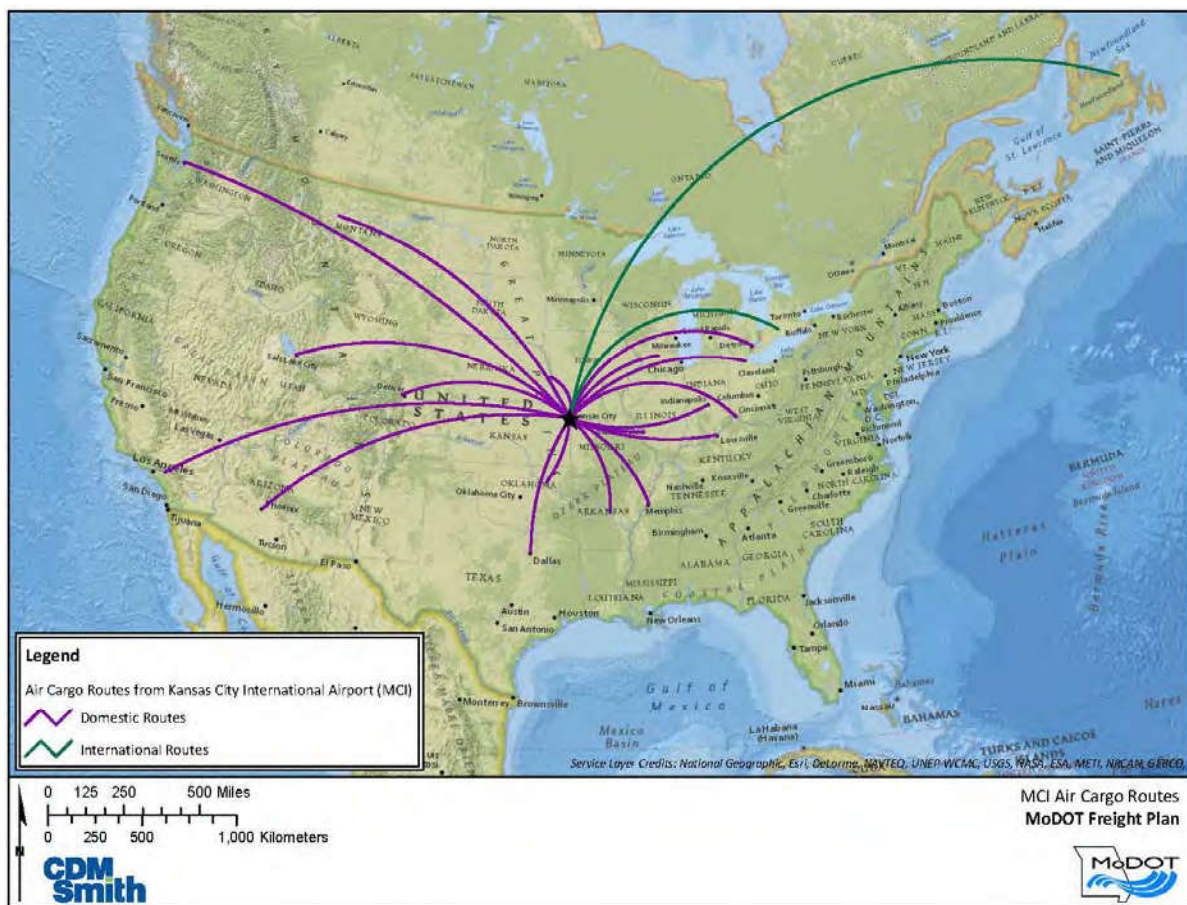
Appendix A: Assets and Freight Flow Technical Memo

Table A-17: Kansas City Air Cargo Destination Airports

Kansas City Air Cargo Destination Airports			
Kansas City to:	Destination	Kansas City to:	Destination
MCI to:	Cincinnati, OH	MCI to:	Memphis, TN
MCI to:	Dallas/Fort Worth, TX	MCI to:	Omaha, NE
MCI to:	Denver, CO	MCI to:	Ontario, CA
MCI to:	Detroit, MI	MCI to:	Phoenix, AZ
MCI to:	Great Falls, MT	MCI to:	Rockford, IL
MCI to:	Gander, Canada	MCI to:	Salt Lake City, UT
MCI to:	Indianapolis, IN	MCI to:	Seattle, WA
MCI to:	Little Rock, AR	MCI to:	St. Louis, MO
MCI to:	Louisville, KY	MCI to:	Toledo, OH
MCI to:	London, Canada	MCI to:	Tulsa, OK

Source: Bureau of Transportation Statistics, Research and Innovative Technology Administration, Internet Lookup, 2014

Figure A-16: MCI Domestic and International Air Cargo Routes



Source: Bureau of Transportation Statistics, Research and Innovative Technology Administration, Internet Lookup, 2014

Appendix A: Assets and Freight Flow Technical Memo

Lambert-St. Louis International Airport

Lambert-St. Louis International Airport (STL) is situated on 2,800 acres of land and has four runways, the longest of which measures 11,019 feet in length. It is located approximately 10 miles northwest of St. Louis. It is the second busiest airport in Missouri in terms of annual air cargo tonnage, but the busiest airport in terms of passenger enplanements. In 2013, STL handled 64,557 tons of freight and mail, which ranks 56th in the U.S./North America.

STL is served by three major dedicated cargo airlines. Operators include integrated express carriers such as FedEx Express, UPS, and DHL. STL was formerly a major cargo hub, as the home base of Trans World Airlines (TWA), until the latter's absorption into American Airlines in 2001. TWA's St. Louis hub decreased after the merge due to its proximity to American Airline's larger hub at Chicago's O'Hare International Airport. As a result, STL went from 800 daily flights with TWA to having fewer than 200 daily flights with American. After the merge of TWA into American Airlines cargo tonnage at STL decreased from 130,000 tons in 2000 to 120,000 tons in 2002. MCI had a similar decrease in cargo from 2000-2002 (151,000 to 135,000).

Today's cargo area includes 231,500 square feet of fully-equipped cargo transit sheds, bonded warehouses, high-security warehousing, special handling facilities, freighter parking stands and direct ramp access.

In addition, numerous passenger airlines serving St. Louis provide cargo storage capacity on routes operated with wide-body aircraft. This cargo capacity is utilized primarily on international routes where wide-body aircraft are necessary. STL and its airlines serve the region with wide-body flights to many international destinations in Canada, Mexico, and China. Air Canada is an example of an international wide-body operator.

STL's location allows easy access to all forms of multi-modal transportation, while its immediate proximity to Foreign Trade Zone No. 102 allows businesses that utilize the zone to take advantage of significant cost savings.

Common goods shipped through STL include aerospace equipment, computers, auto parts, clothing and shoes, and paper products.

STL has wide-body passenger connections to Mexico, Canada, and China that operate passenger and belly cargo services. STL International's domestic air cargo routes are illustrated in **Table A-18** while its international air cargo routes are illustrated in **Figure A-17**.

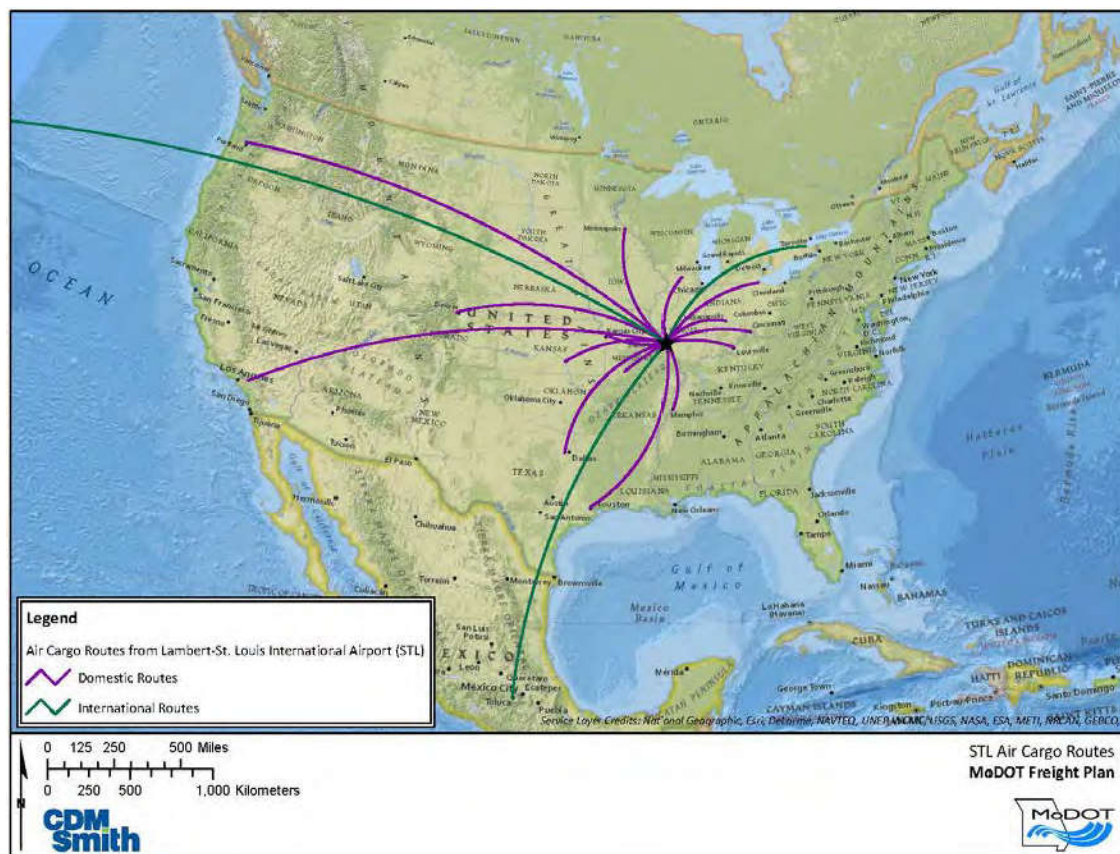
Table A-18: St. Louis Air Cargo Destination Airports

St. Louis Air Cargo Destination Airports	
Destination	Destination
Arlington, TX	Mexico City, Mexico
Cincinnati, OH	Minneapolis, MN
Denver, CO	Oakland, CA
Hamilton, Canada	Portland, OR
Houston, TX	Rockford, IL
Indianapolis, IN	Shanghai, China
Kansas City, MO	Springfield, MO
Louisville, KY	Toledo, OH

Source: Bureau of Transportation Statistics, Research and Innovative Technology Administration, Internet Lookup, 2014

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Figure A-17: STL Domestic and International Air Cargo Routes



Source: Bureau of Transportation Statistics, Research and Innovative Technology Administration, Internet Lookup, 2014

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Springfield-Branson National Airport

Springfield-Branson National (SGF) is located approximately 5 miles northwest of the City of Springfield, Missouri. SGF maintains one 7,003-foot runway and one 8,000-foot runway. It was the third busiest airport in Missouri by both passenger enplanements and annual air cargo tonnage. In 2013, SGF handled 12,693 tons, ranking 106th in the U.S. SGF has a Foreign Trade Zone (FTZ) designated facility on site. This means that foreign merchandise entering the FTZ can be re-exported, and in this case customs procedures are streamlined and tariffs do not apply.

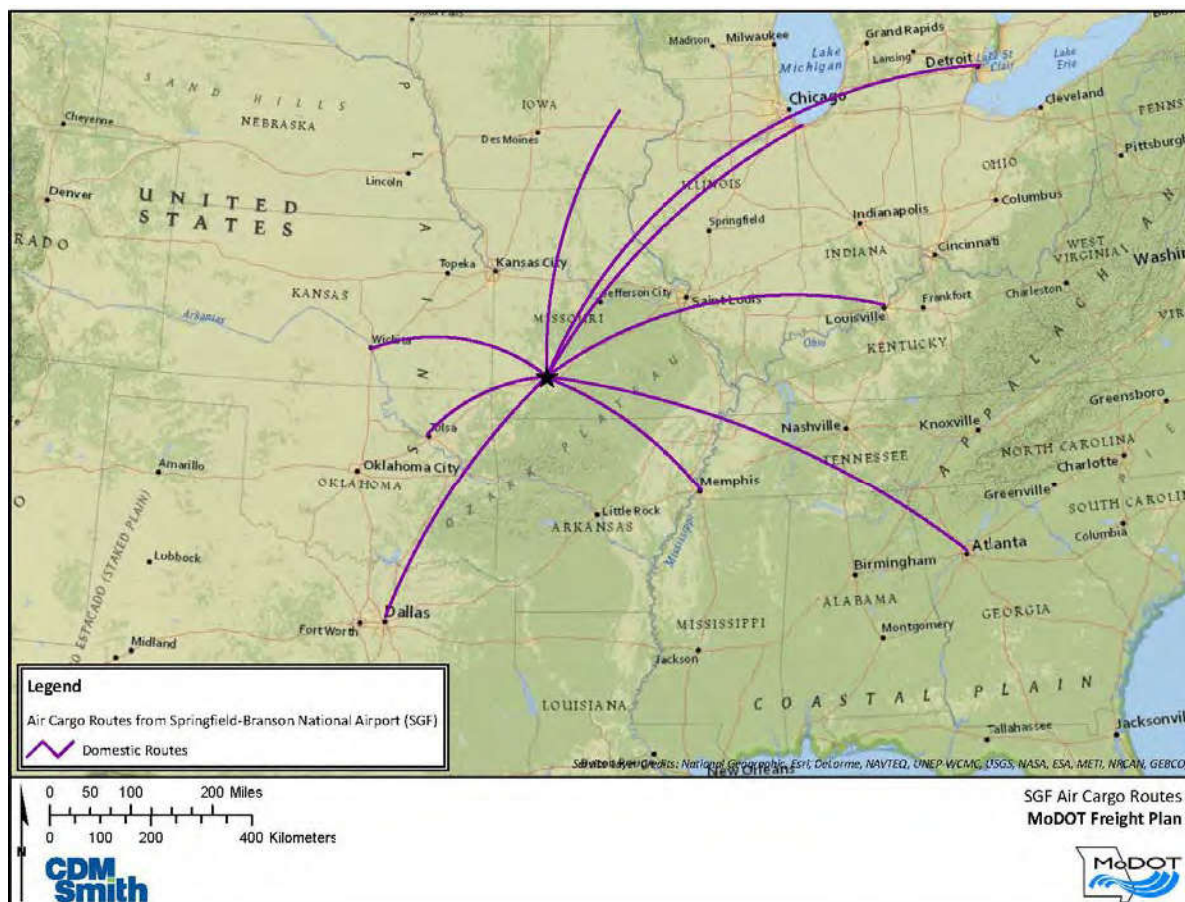
American Airlines, Allegiant Air, Delta, and United are the four passenger air carriers that provide air service from SGF to various destinations throughout the U.S. However, passenger airlines serving SGF currently do not provide major cargo service from this location. Springfield-Branson National's domestic air cargo routes are illustrated in Table A-19 and Figure A-18.

Table A-19: Springfield Air Cargo Destination Airports

Springfield Air Cargo Destination Airports	
Destination	Destination
Atlanta, GA	Louisville, KY
Cedar Rapids/Iowa City, IA	Memphis, TN
Dallas/Fort Worth, TX	Tulsa, OK
Detroit, MI	Wichita, KS
Gary, IN	

Source: Bureau of Transportation Statistics, Research and Innovative Technology Administration, Internet Lookup, 2014

Figure A-18: Springfield Domestic Air Cargo Routes



Source: Bureau of Transportation Statistics, Research and Innovative Technology Administration, Internet Lookup, 2014

Appendix A: Assets and Freight Flow Technical Memo

Pipeline

Approximately 10,700 miles of pipelines move natural gas, crude oil, and petroleum products throughout Missouri. **Table A-20** lists the number of pipeline miles by commodity. The U.S. DOT Pipeline and Hazardous Materials Safety Administration (PHMSA) regulates pipeline transport. The Office of Pipeline Safety (OPS – within PHMSA) inspects and enforces interstate pipeline safety regulations and certifies State representatives, through the Missouri Public Service Commission, for intrastate inspection.

Table A-20: Missouri Pipeline Transmission Mileage by Commodity

Missouri Pipeline Transmission Mileage by Commodity

Commodity	Pipeline Miles
Natural Gas	4,587
Refined Products	2,046
Crude Oil	1,591
Liquefied Petroleum Gas HVL	1,132
Empty Liquid	790
Anhydrous Ammonia HVL*	420
Natural Gas Liquids HVL*	153
Total Pipeline Miles	10,719

**HVL=highly volatile liquid*

Source: http://primis.phmsa.dot.gov/comm/reports/safety/MO_detail1.html?nocache=6500#_OuterPanel_tab_5

Accessed on February 5, 2014

The highest percentages of pipeline miles, according to PHMSA Missouri Incident and Mileage Overview, are in St. Charles County (4.9 percent), Cass County (3.6 percent), Audrain County (3.5 percent), and Johnson County (3.4 percent), which are located in the northern half of the State where the majority of major pipelines pass.¹⁹

There are several major crude oil, petroleum product, and liquefied petroleum gas pipelines traversing the State as identified by the PHMSA. Many of the crude oil and petroleum product pipelines originate near the Gulf Coast (Texas) and Oklahoma, as well as Canada, and pass through the State en route to Midwest refineries, including the Wood River, Illinois, refinery across the Missouri border near St. Louis. Natural gas supplies are primarily from the south-central U.S. and Rocky Mountain region including Oklahoma, Texas, and Colorado. **Table A-21** lists the major pipelines in Missouri and their extents and **Figure A-19** shows their locations.

The Energy Information Administration (EIA) maintains a database of recently completed and upcoming U.S. natural gas pipeline projects. No future projects in Missouri have been announced. TransCanada's proposed Keystone XL pipeline would connect to the existing Keystone Pipeline in Steele City, Nebraska, and increase access to Midwest markets. The project is currently awaiting decision on a Presidential Permit application. Enbridge is currently constructing the Flanagan South Pipeline Project adjacent to their Spearhead pipeline to provide more efficient transportation of oil from western Canada and North Dakota to refinery hubs in the Midwest and Gulf Coast. The Flanagan South line is planned to be in service by the end of 2014.

¹⁹ http://primis.phmsa.dot.gov/comm/reports/safety/MO_detail1.html

Appendix A: Assets and Freight Flow Technical Memo

Table A-21: Major Missouri Pipelines-Locations and Operators

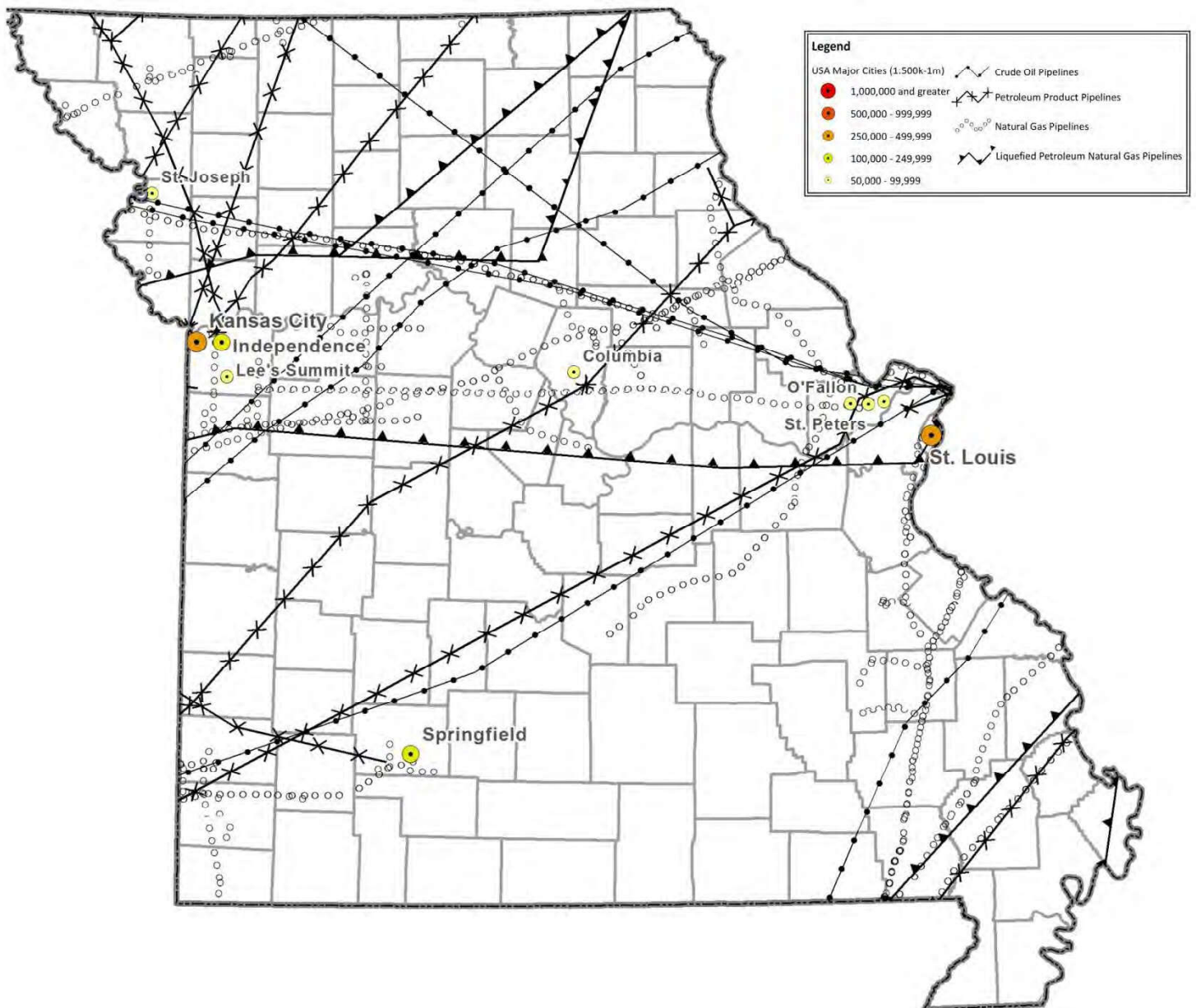
Major Pipelines in Missouri			
	Operator	Pipeline Name	Missouri Extents (approx.)
Crude Oil	Koch Pipeline	MinnCan	Bethany to Wood River, IL
	ExxonMobil	Pegasus	Doniphan to Perryville
	Enbridge	Ozark	Joplin to St. Louis
	Enbridge	Spearhead	Drexel to Palmyra
	BP Pipelines	Cushing to Whiting	Drexel to Kahoka
	Spectra Energy	Platte	St. Joseph to Wood River, IL
	TransCanada	Keystone	St. Joseph to Wood River, IL
Petroleum Product	Enterprise	TeppCo	Campbell to Cape Girardeau
	Explorer Pipeline	Houston to Wood River	Joplin to Wood River, IL
	Midstream Partners	Magellan	Lamar to Springfield
	Midstream Partners	Magellan	Lamar to Hannibal
	Midstream Partners	Magellan	St. Joseph to Albany
	Midstream Partners	Magellan	Kansas City to Bethany
	Buckeye Partners	Buckeye	Tarkio to Kansas City to Unionville
Liquefied Petroleum Natural Gas	Enterprise Products	TeppCo	Doniphan to Cape Girardeau
	Enterprise Products	Centennial	New Madrid to Charleston
	Enterprise Products	East Leg	Platte City to Memphis
	Conoco Phillips	Blue Line	Drexel to Wood River, IL
Natural Gas	Panhandle Energy	Panhandle East	Drexel to Louisiana
	Tallgrass	Rockies Express (REX)	St. Joseph to Louisiana
	TransCanada	ANR Pipeline	Mound City to Bethany
	Southern Star	–	Drexel to St. Peters
	Central Gas	–	–
	MoGas Pipeline	–	Waynesville to St. Louis to Bowling Green
	Enable Midstream Partners	Mississippi River Transmission	Doniphan to Farmington/St. Louis
	KinderMorgan	Natural Gas Pipeline Co. of America	Doniphan to Jackson
	Spectra Energy	Texas Eastern Transmission	Campbell to Cape Girardeau

Source: <http://www.eia.gov/state/?sid=M> and <http://www.eia.gov/state/data.cfm?sid=MO#DistributionMarketing>

Accessed on February 5, 2014

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Figure A-19: Major Pipelines in Missouri



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Intermodal Facilities

The National Transportation Atlas Data through the Bureau of Transportation Statistics identified 110 intermodal facilities located in Missouri that provide a variety of intermodal interactions. The majority of the intermodal facilities (73 percent) accommodate rail – truck commodity transfers followed by modal transfers at ports (13 percent) and airports (7 percent) as shown in **Table A-22**.

Table A-22: Number and Percent of Missouri Intermodal Facilities

Intermodal Facilities by Type		
Intermodal Type	Number of Facilities	Percent of Total Intermodal Facilities
Rail – Truck	82	71.3%
Port – Truck/Rail	18	15.7%
Air – Truck	9	7.8%
Truck - Truck	6	5.2%
Total	115	100.0%

Source: Bureau of Transportation Statistics

The majority of the intermodal activity occurs in the metropolitan areas; see **Table A-23**. The Kansas City area has 47 while St. Louis has 30 of the intermodal facilities. Springfield (six) and St. Joseph (four) also have smaller clusters of intermodal facilities. The remaining 28 intermodal facilities are dispersed throughout the State. The intermodal facilities are shown in **Figure A-20**.

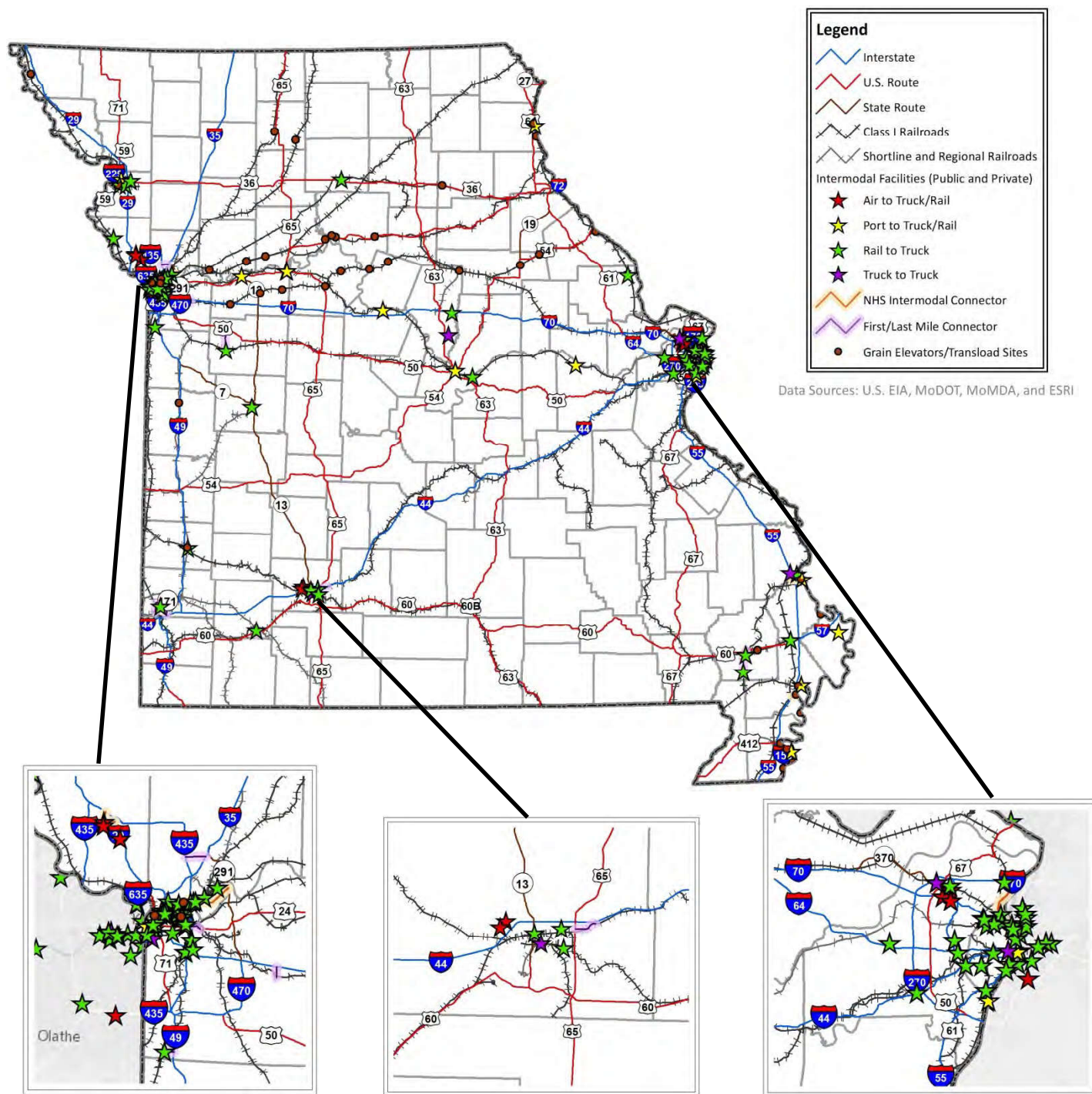
Table A-23: Missouri Intermodal Facilities by Location

Intermodal Facilities by Location		
Intermodal Facility Location	Number of Facilities	Percent of Total
Kansas City	47	40.9%
St. Louis	30	26.1%
Springfield	6	5.2%
St. Joseph	4	3.5%
Rest of State	28	24.3%
Total	115	100.0%

Source: Bureau of Transportation Statistics

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Figure A-20: Intermodal Facilities



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Freight Generators

American Transportation Research Institute (ATRI) analyzed truck Global Positioning System (GPS) data from Missouri to identify census block groups where freight activity is most intense. The output from this analysis provides insight regarding the source locations of freight movement. The ATRI *Missouri Freight Generators Analysis* is located in Attachment B.

The goal of this analysis is to identify geographic locations (at the block group level) where freight is generated. Such locations include distribution centers, warehouses, manufacturing facilities and other origins and destinations. These locations were identified based on the intensity of truck activity within block group.

To conduct the analysis, a truck GPS dataset was first assembled that included data for four months (February, May, August, and November) in 2013. The dataset was limited to points inside the boundary of Missouri; within Missouri, there were no geographic limitations.

Using a sample of this dataset, ATRI identified 400 freight-significant block groups out of a total of 4,506 in the State based on truck GPS data activity within each block group. ATRI's sample included only stopped trucks to identify 400 block groups with the greatest freight intensity. This identification allowed the research team to filter the larger statewide dataset and focus on only on data from freight generators.

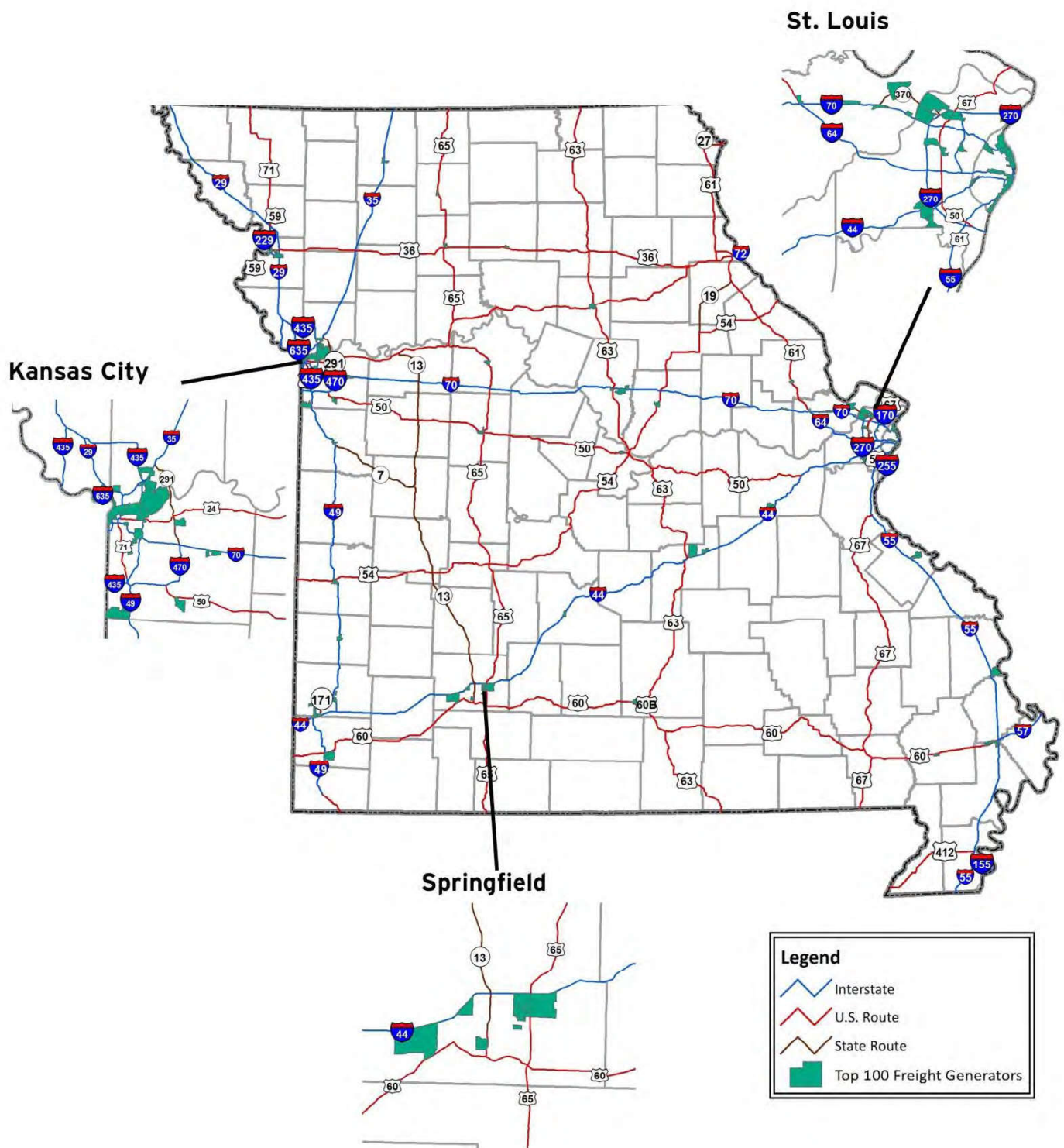
The next step was to identify the 100 most intense freight generators among the 400 block groups. To do this, a second filter was employed. Data points that fell on major roadways or at truck stops were removed from the dataset using various GIS based filters. After this process, which took advantage of available proprietary GIS layers (e.g. roadway networks), additional manual reviews were conducted using aerial imagery to identify data that fell within a block group but outside of a freight generator. The end result was a dataset that included only vehicle GPS positions within the vicinity of a freight generator facility. The process resulted in a refined truck position data set that identified, based on number of position reads, a set of 100 top freight generator block groups.

Figure A-21 depicts the 100 freight generators identified through this analysis. Each of the 100 locations is shown in orange. The analysis found that the majority of key freight generators were located along major roadways. Furthermore, urban areas such as St. Louis and Kansas City contained the highest share of generators, although several other freight generating locations were identified throughout the State. The final two figures depict the freight generator locations in greater detail for the Kansas City (**Figure A-22**) and St Louis (**Figure A-23**) metro areas. The freight generators were divided into five tiers with Tier 1 being the most active generators and Tier 5 having less activity based on the ATRI truck GPS data.

This information can be used by MoDOT, in conjunction with an analysis on truck bottlenecks, to prioritize infrastructure investments that will improve mobility in the State. In particular, this information may be valuable for identifying the investment needs of critical last-mile connectors.

Appendix A: Assets and Freight Flow Technical Memo

Figure A-21: Top 100 Identified Freight Generators: Census Block Groups

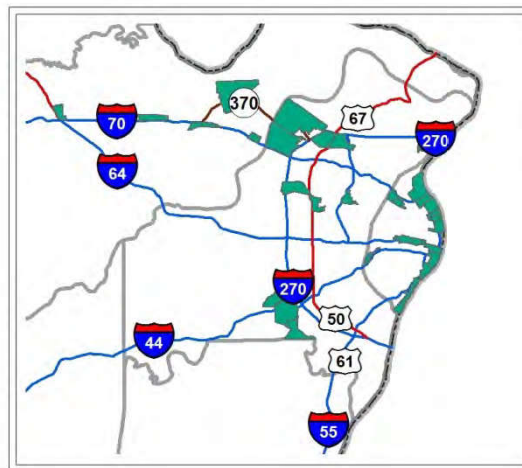


Appendix A: Assets and Freight Flow Technical Memo

Figure A-22: Top 100 Freight Generator Census Blocks: Kansas City Detail



Figure A-23 Top 100 Freight Generator Census Blocks: St Louis Detail



Appendix A: Assets and Freight Flow Technical Memo

Freight System Condition and Performance

This section discusses the existing and future condition, performance, and safety of Missouri's freight system.

Condition

Highway Conditions

MoDOT began an initiative in 2004 that focused on improving major highways. MoDOT set a target of 85 percent of major highways in good condition. Since 2009 when Tracker was implemented, Missouri major highways have exceeded the State target. In 2013, the nearly 90 percent of Missouri's major highways were in good condition which includes over 91 percent of the Interstates.

With a focus on major highways, the minor road system conditions declined in the early years of that program, with 60 percent of the minor roads in good condition in 2009. Since this date the minor road conditions have trended upward to the 2013 mark of over 78 percent of the minor roads in good condition. However, this trend has not continued and conditions have trended downward since 2013.

Highway Restrictions

Truck traffic is often restricted on highways due to low clearances at overpasses and weight restrictions on bridges. Current limits for vehicles which travel on MoDOT roadways without oversize or overweight permits reported on the MoDOT website are:

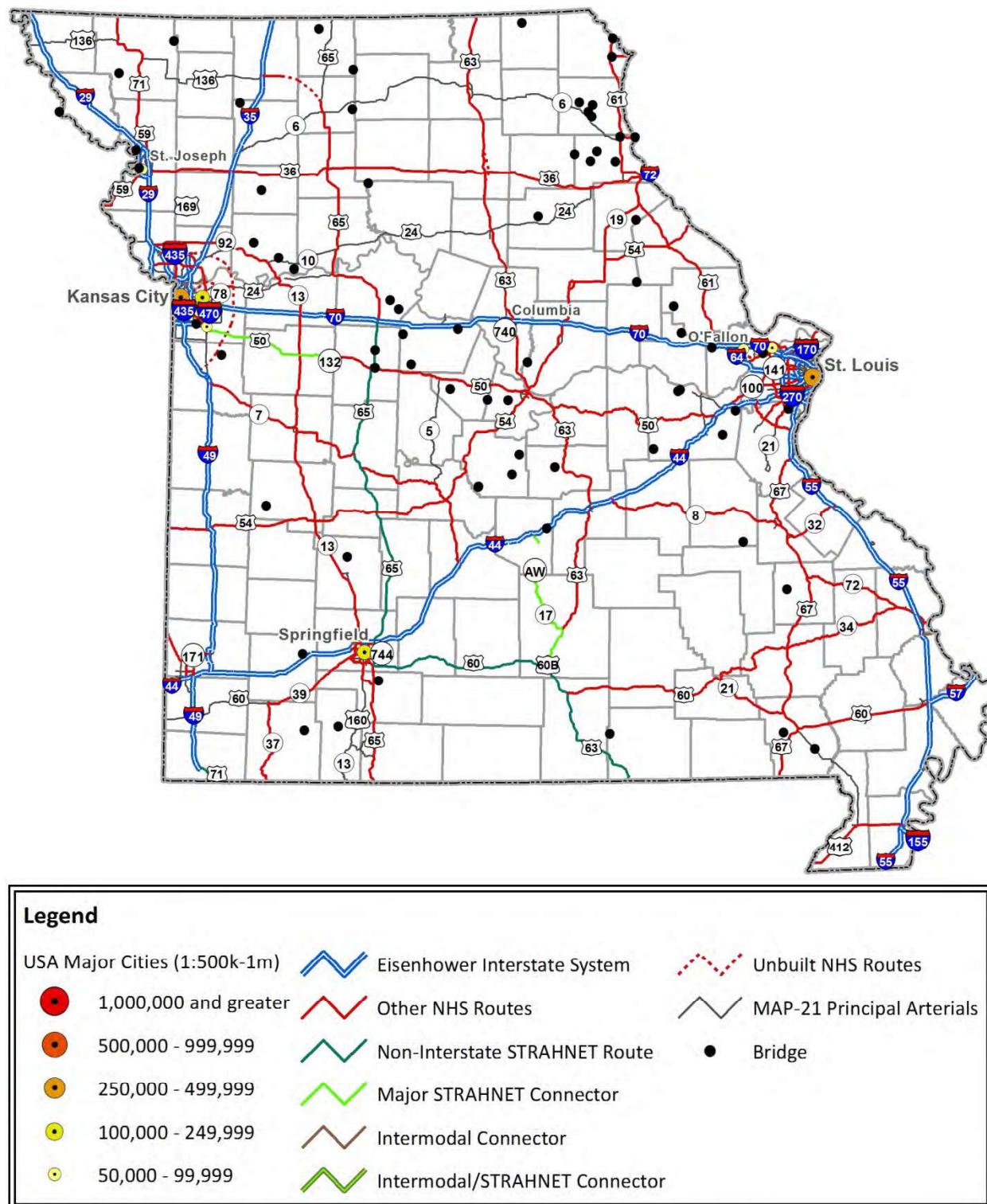
- Width - 8 feet 6 inches
- Height - 14 feet
- Gross Weight - 80,000 pounds maximum

There are a total of 73 low vertical-clearance bridges in Missouri. This represents less than one percent of all bridges in the State. None of these bridges cross interstates and four bridges (five percent) cross U.S. highways. **Figure A-24** shows the locations of these low clearance bridges.

In addition to the low clearance bridges there are 4,849 load-restricted bridges in Missouri. This is about 20 percent of all bridges in the State. One hundred and thirty-five (three percent) of these bridges cross interstates and 81 (two percent) cross U.S. highways. **Figure A-25** shows the locations of these load-restricted bridges. Forty-four of these load-restricted bridges are also low clearance bridges.

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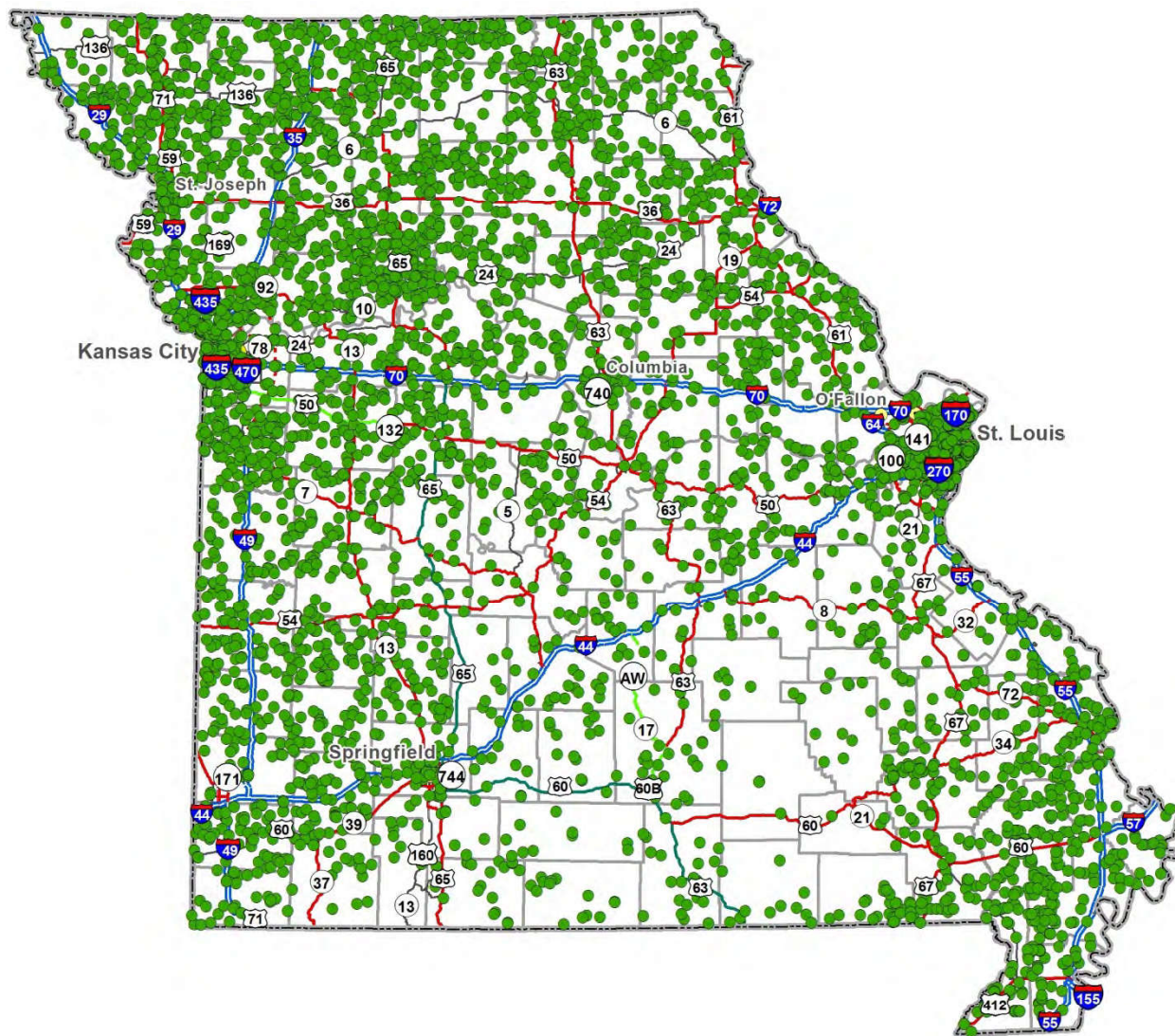
Figure A-24: Low Clearance Bridges in Missouri



Data Sources: USDOT BTS, USDOT FHWA, MoDOT, and ESRI

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Figure A-25: Load-Restricted Bridges in Missouri



Legend

USA Major Cities (1:500k-1m)

- 1,000,000 and greater
- 500,000 - 999,999
- 250,000 - 499,999
- 100,000 - 249,999
- 50,000 - 99,999



Eisenhower Interstate System



Other NHS Routes



Non-Interstate STRAHNET Route



Major STRAHNET Connector



Intermodal Connector



Intermodal/STRAHNET Connector



Unbuilt NHS Routes



MAP-21 Principal Arterials



Load Restricted Bridges

Data Sources: USDOT BTS, USDOT FHWA, MoDOT, and ESRI

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Waterway Characteristics/Operations

Waterways are the original Missouri transportation system. This resource led to wealth and development that then spread outward from Missouri's rivers. A "standard" tow is 15 barges with a capacity of 22,500 tons or 45 million pounds. "Large" tows on the Mississippi below St. Louis can be as large as 40 barges. It would take two 100 railroad cars or 870 semi-trucks to carry the same amount of cargo as a standard tow. Unlike trucks, tows can carry a lot of cargo with relatively few crewmembers. Additionally, waterways are inherently grade-separated from highways and railways; thus, they do not cause congestion in other modes. When waterborne cargo is used instead of trucking, it saves fuel and improves highway conditions including safety, reduced congestion, pavement life and reduced emissions. Reducing fuel and labor costs reduces transportation costs, improving profits commercially and agriculturally.

Waterways are comparable in capacity and importance to interstate highways. Annual cargo through Missouri's ports is worth billions of dollars. Assets of public ports are comparable to industrial parks.

Performance

Truck Bottlenecks

The Freight Performance Measures (FPM) database compiles anonymous trucking operations data from several hundred thousand trucks using GPS data from onboard trucking systems - generating billions of data points annually. Each truck used in FPM analysis has a regular position read (generally every 1 to 15 minutes) and includes information on vehicle location, unique vehicle identification, time/date, and, in many cases, vehicle spot speed (which is obtained from the vehicle's engine). Through these attributes, ATRI performs spatial queries and relates the FPM truck GPS data to a variety of transportation datasets using customized software and proprietary database management workflows.

The truck GPS data from February, May, August, and November of 2013 was aggregated, generating an average speed and a count of position reads (i.e. sample size) for each hour of the day across all 3,311 segments. Average hourly speeds were aggregated into four time periods to produce a statewide speed profile by time of day:

- Morning Peak (6:00 to 9:59 a.m.)
- Midday (10:00 a.m. to 2:59 p.m.)
- Evening Peak (3:00 p.m. to 6:59 p.m.)
- Off-peak (7:00 p.m. to 5:59 a.m.)

The difference in travel time for each period compared to the off-peak travel time was multiplied by the per-mile size of the sample for that period and the values for the three periods were added together to generate the total congestion index. The 100 segments with the highest congestion indices were isolated for further analysis as the top trucking bottlenecks in Missouri. The following sections present the results of the statewide speed profile and the analysis of the top 100 truck bottleneck locations. The average speed by time of day was the primary input to the bottleneck analysis. However, it was also necessary to utilize an indicator of volume in the bottleneck analysis to ensure that roads with moderate to heavy truck volume were more heavily weighted in the bottleneck analysis than roads with little to no truck traffic. The Missouri Congestion Analysis performed by ATRI is in Attachment C.

ATRI generated a congestion index for each network segment. The 100 segments with the highest congestion index were isolated for additional analysis as the most severe truck bottlenecks in Missouri. **Figure A-26** presents the 100 segments identified as bottlenecks through this analysis. St. Louis and Kansas City contained 81 out of the state's 100 worst truck bottlenecks; however, Springfield also contained several bottlenecks, as did other cities and towns across the State.

Figure A-27 provides a more detailed view of the St. Louis area, which contained 59 out of 100 bottlenecks. The most severe bottlenecks appear to be concentrated near the confluence of Interstates 70, 64, 55, and 44 near downtown St. Louis. Other problem areas include I-270 on the west side between I-64 and I-44 and again on the north side near I-170. I-70 was also problematic west of I-270 and again west of MO-370. Additionally, segments of I-64 west of I-270 made the bottleneck list. Several arterials also experienced a high level of delay, including Kingshighway Boulevard, Grand Boulevard, Arsenal Street, MO-115, and MO-180.

Figure A-28 highlights the 22 bottlenecks identified in the Kansas City area. The analysis revealed two primary bottleneck clusters and several other isolated bottlenecks. The complex intersection with I-70, I-670, I-35, and MO-9 generated a truck bottleneck along all of those routes near downtown Kansas City. Additionally, Front Street and the Chouteau Freeway, which are located near a major rail facility, were among the worst bottlenecks in the State. Beyond those two bottleneck clusters,

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other problem areas include I-70 east of I-435, I-435 west of I-470, I-35 north of MO-291, US-71 between 75th Street and 55th Street, and 23rd Street between I-70 and I-435.

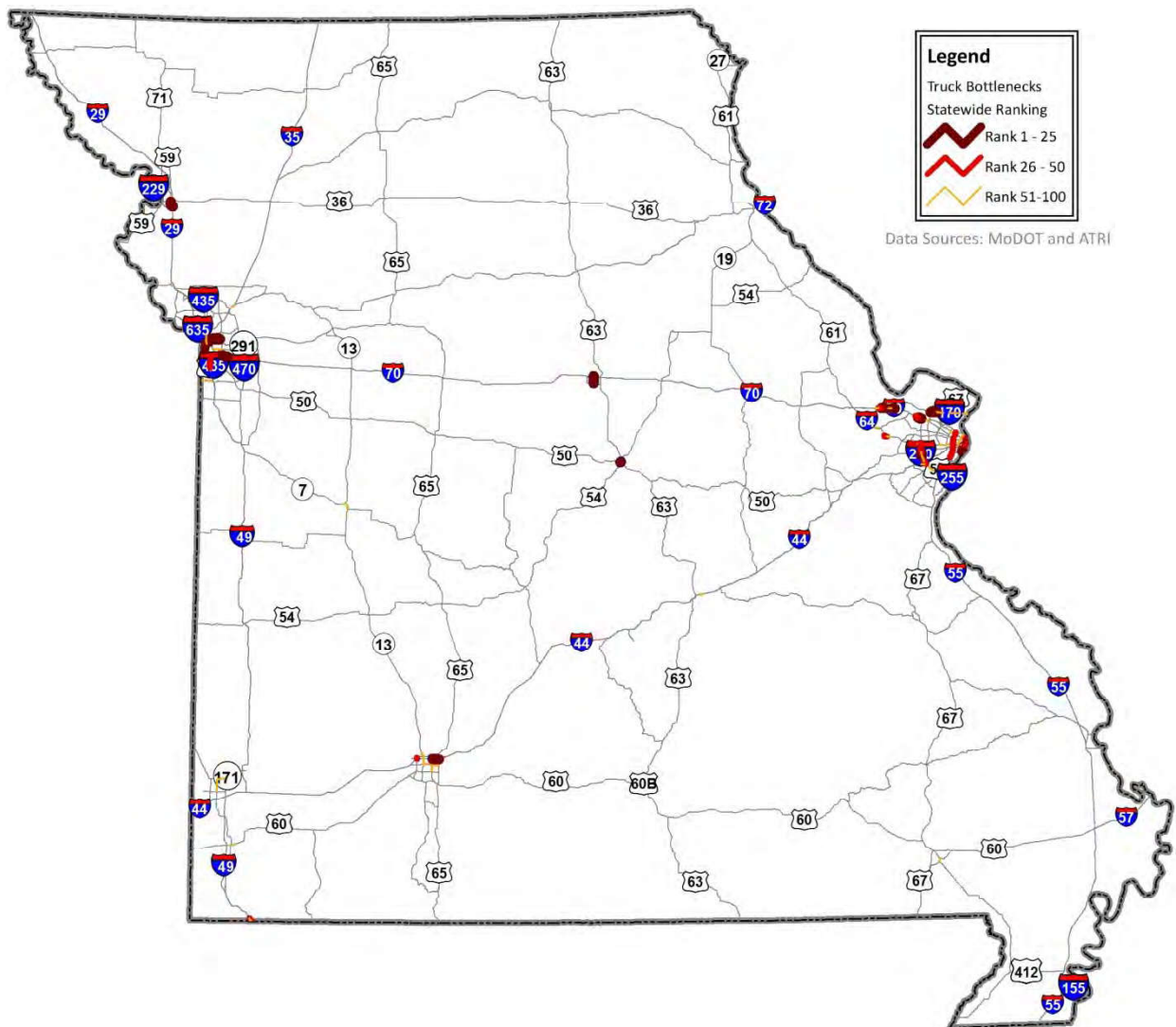
Figure A-29 illustrates the seven bottlenecks identified in the Springfield area. The most severe bottleneck in the area was located on MO-744 (E. Kearney Street) between US-65 and N. Glenstone Avenue. A small portion of US-160 south of I-44 also ranked highly on ATRI's analysis. Other bottlenecks include portions of MO-13, the Chestnut Expressway from MO-13 to US-65 (partially signed I-44 Business), and US-65 Business from the Chestnut Expressway to East Sunshine Street.

Beyond the urban areas of St. Louis, Kansas City, and Springfield, several other truck bottlenecks were identified throughout Missouri. **Figure A-30** presents the remaining bottlenecks in the state, which includes:

- US-169 between I-29 and US-36 near St. Joseph (Inset 1)
- MO-163 south of I-70 in Columbia (Inset 2)
- US-60 Business between US-54 and US-50 in Jefferson City (Inset 3)
- I-44 east of Rolla (Inset 4)
- US-67 Business in Poplar Bluff (Inset 5)
- US-60 east of I-49 near Neosho (Inset 6)
- Several segments of US-71 near the Arkansas border (Inset 6)
- Portions of I-49 Business and MO-171 near Joplin (Inset 7)
- MO-7 and MO-13 in Clinton (Inset 8)

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Figure A-26: 100 Most Congested Trucking Bottlenecks in Missouri



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Figure A-27: Most Congested Trucking Bottlenecks in St. Louis

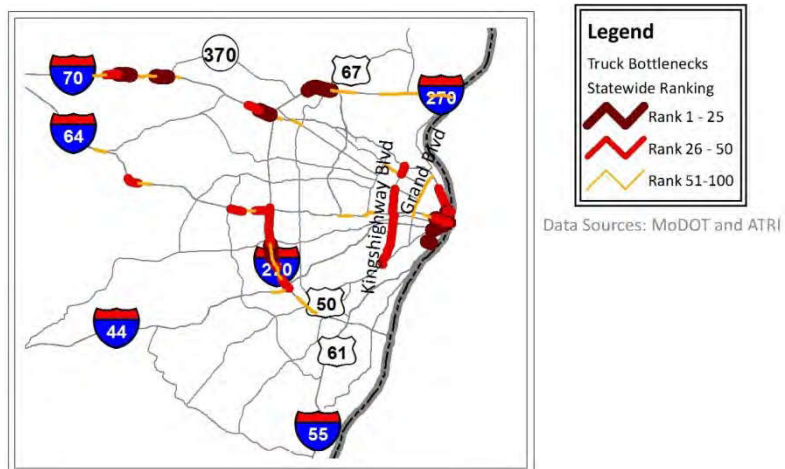


Figure A-28: Most Congested Trucking Bottlenecks in Kansas City

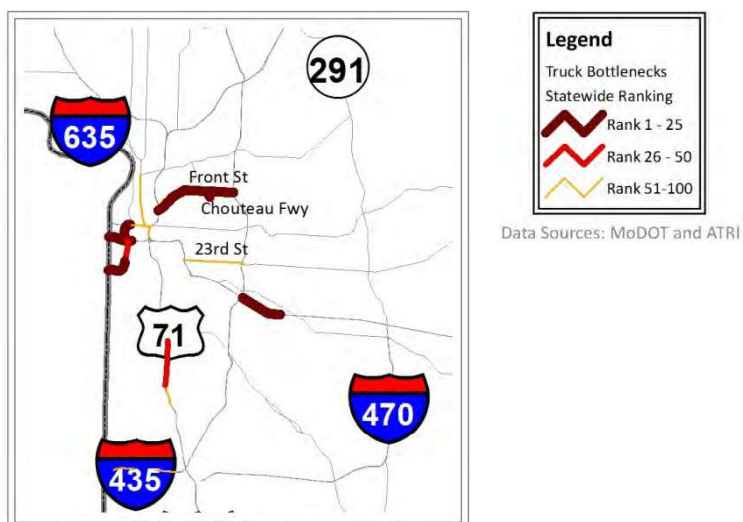
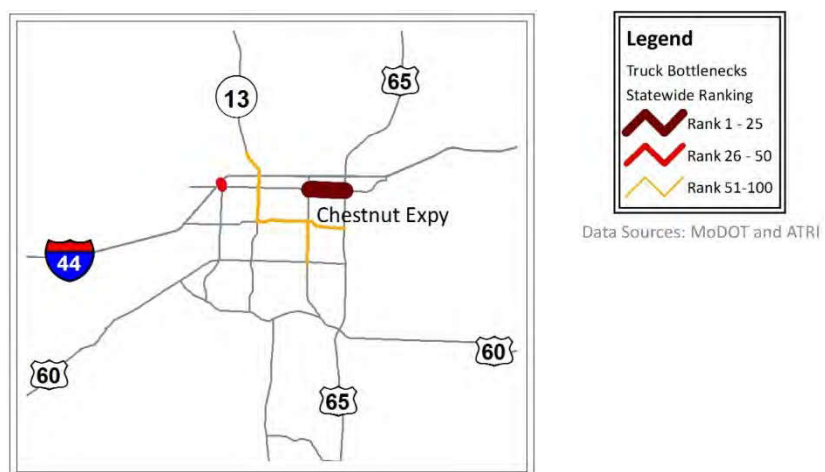
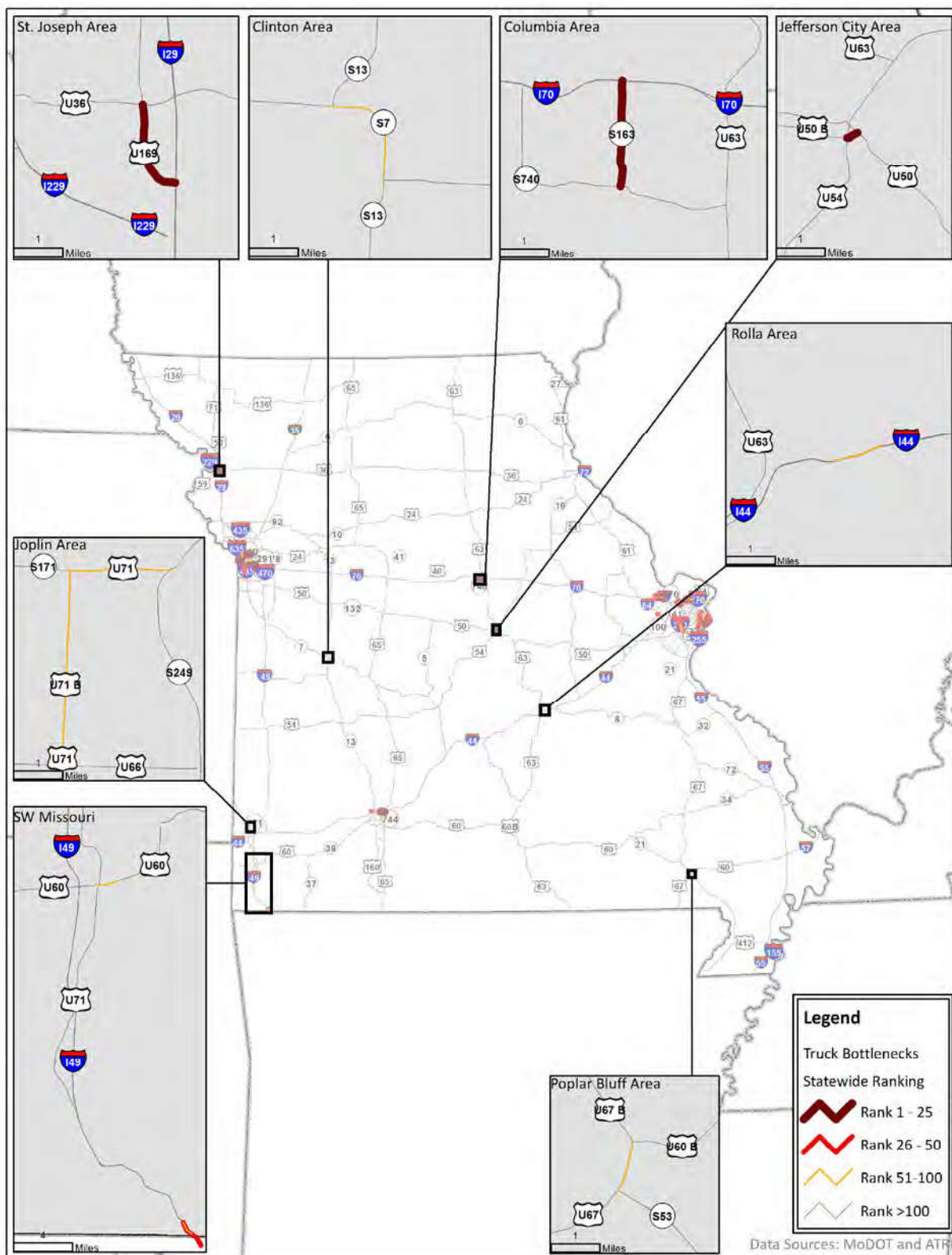


Figure A-29: Most Congested Trucking Bottlenecks in Springfield



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Figure A-30: Other Truck Bottleneck Locations in Missouri



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Rail Bottlenecks

The National Rail Freight Infrastructure Capacity and Investment Study prepared by the Association of American Railroads (AAR) has developed a methodology for determining the level of service for a specific freight rail corridor. The basis for determining the level of congestion on a rail corridor is a calculated volume-to-capacity ratio. To determine the ratio, many system attributes are factored in, including: number of tracks, yard capacity, siding length, track speed, locomotive type, and terrain. Since this is a statewide, high-level study of rail capacity in Missouri, three factors - ratio number of tracks, train control system and train type - are used in determining current capacity.

The following is a summary of the 2012 level of service based on the volume to capacity (V/C) of the rail line for railroads operating in Missouri.²⁰ Some of this level of service data may have changed since 2012 due to the economy and demand of specific goods.

Volume Approaching Capacity (0.8 - 1.0)

1. MNA - Aurora Sub (from Carthage to Arkansas State line to south)
2. BNSF - Fort Scott Sub (from Springfield to Kansas State line to west)
3. BNSF - Brookfield Sub (from Kansas City to Iowa State line to northeast)
4. BNSF - Hannibal Sub (from St. Louis to Iowa State line to northeast)
5. KCS - Pittsburg Sub (from Kansas City to Kansas State line to southwest)
6. Terminal Railroad Association of St. Louis (from I-170 to Illinois State line to east)
7. UP - Sedalia Sub (from I-435 to Kansas State line to west)

Volume Exceeding Capacity (> 1.0)

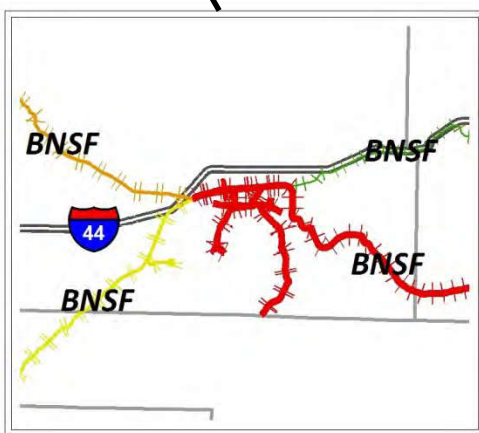
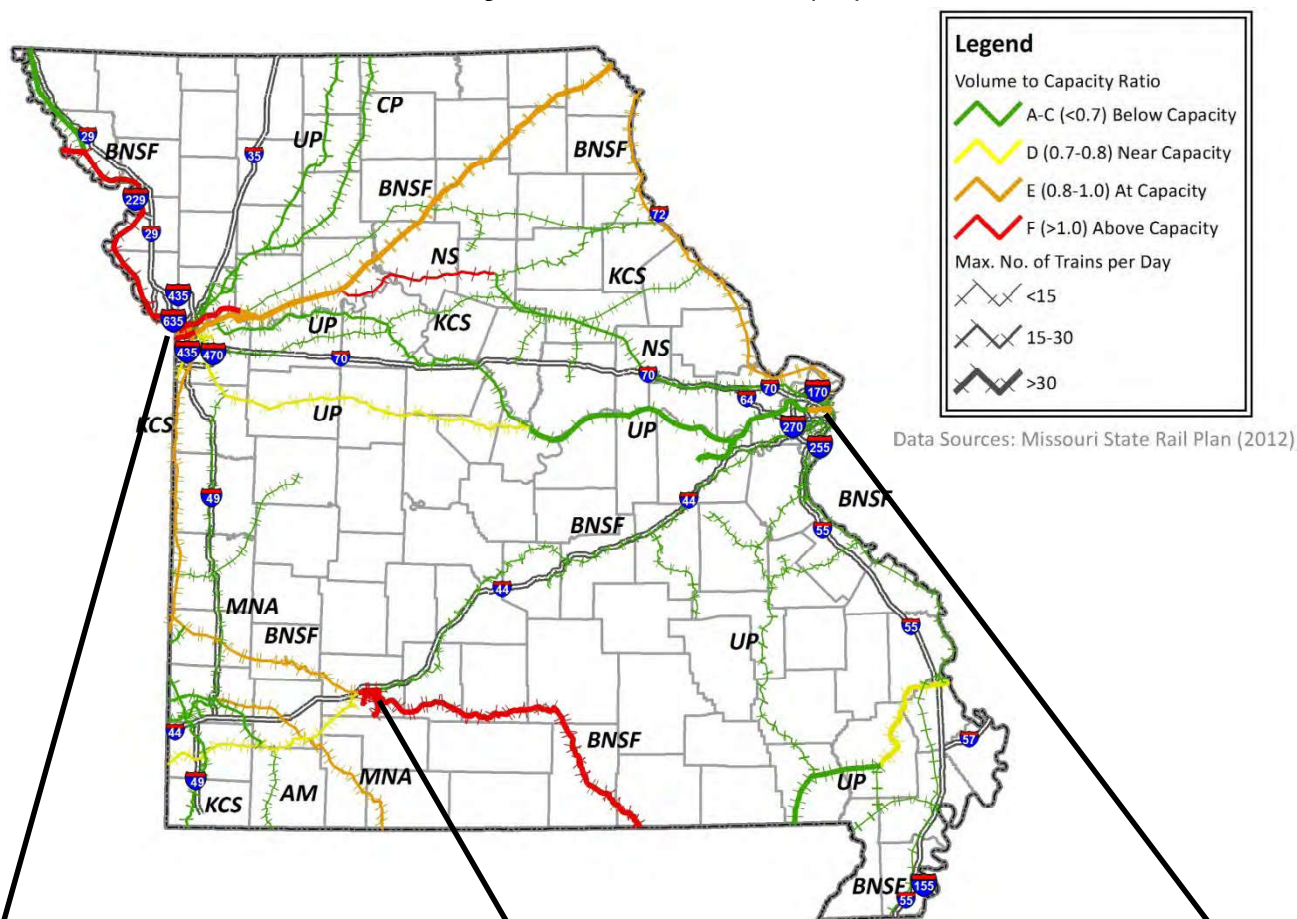
1. BNSF - Thayer North Sub (from Springfield to Arkansas State line to south)
2. BNSF - St. Joseph Sub (from Kansas City to Nebraska State line to northwest)
3. UP - Chester Sub (from Dexter to Illinois State line to east)
4. UP - Hoxie Sub (from Dexter to Arkansas State line to south)
5. UP - Sedalia Sub (from Jefferson City to Kansas City)
6. NS - Kansas City District (from Moberly to Kansas City)
7. Kansas City Terminal Railroad (from I-435 to Kansas State line to west)

The map in **Figure A-31** illustrates the volume-to-capacity ratio and the maximum number of trains per day for each freight rail corridor in Missouri. The Interstate highways are also shown for reference.

²⁰ Missouri State Rail Plan, MoDOT, 2012

Appendix A: Assets and Freight Flow Technical Memo

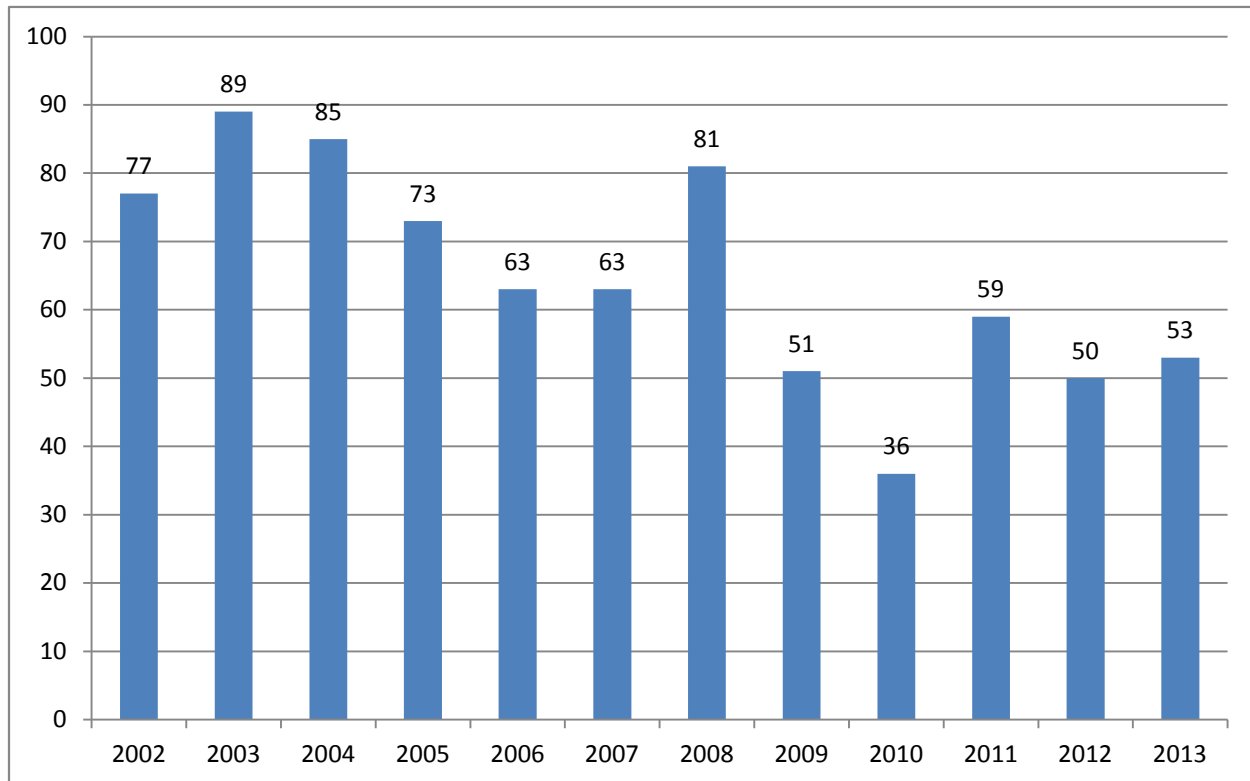
Figure A-31: Rail Corridor Volume to Capacity



Appendix A: Assets and Freight Flow Technical Memo

MoDOT and Missouri's railroad operators understand and promote the importance of railroad safety. MoDOT's website, for example, has rail safety information designed for schools, communities, commercial drivers, driver education programs, and other interested parties. Here people can learn more about railroad grade crossing hazards and safety issues, while also learning more about how to avoid becoming involved in an accident. A train accident can be defined as an event resulting in monetary damage to track and/or on-track rail equipment. This definition does not include lading, clearing costs, and environmental damage. Total accidents/incidents generally represent the sum of train accidents, highway-rail incidents, and other incidents. Other incidents include any event causing a death, an injury or an occupational illness to a railroad employee. The rail vehicle accident/incidents since 2002 are shown in **Figure A-32**.

Figure A-32: Accidents/Incidents in Missouri



Source: http://safetydata.fra.dot.gov/OfficeofSafety/publicsite/on_the_fly_download.aspx

Waterway Issues

Three public port authorities located along the Missouri River have identified improvements of the river's navigation facilities as important. The Missouri River has a large potential to serve most of Missouri farmers. There are eight authorized purposes for the Missouri River and balancing water flow out of the dams to serve all eight has given the Missouri River a reputation for unreliable navigation over the last few years. However, as we are seeing this year, freight is again moving on the MO River as capacity issues on the rail and highway have necessitated the development of additional modes of transporting agricultural products to market.

There is concern from public and private ports about restrictions to floodplain development since all ports are on riverbanks. This issue has contributed to the lack of infrastructure to handle freight. Missouri River port authorities have concerns about Missouri River cargo going through other states instead. To stay in business port authorities are primarily focused on businesses that do not depend solely on waterways.

Container-On-Vessel (COV)

Port authorities, government agencies, and shippers look to the feasibility of COV service to enhance existing truck and rail transport. COV is cost-effective for shippers when measured by unit, operation and labor costs when compared to rail and truck. Potential obstacles to greater use of COV in Missouri include: readiness of ports, delivery requirements for ports to sustain service, and inefficiencies in backhauling empty containers.

Appendix A: Assets and Freight Flow Technical Memo

Initiation of COV service depends on the development of partnerships between key port operators and shipping stakeholders, including navigators, manufacturing, and logistics firms. According to "Missouri Public Port Authorities: Assessment of Importance and Needs" – all current port facilities, with limited capital investments, could operate as a COV facility.²¹

Safety

The three year crash rate (2010 – 2012) was calculated for highway segments proposed for the Missouri freight network based on 100 million vehicle miles traveled (HMVMT).²² The crash rates were developed bi-directionally for each segment. The segments were separated by interstates and all other routes which comprised a combination of U.S. highways and a few Missouri routes. This separation was maintained throughout the analysis since interstates generally have lower crash rates than other route designations. The interstates were divided into 55 segments resulting in 110 bi-directional segments. The U.S. highways and Missouri routes had 57 segments with 114 bi-directional segments.

After the three-year crash rates were calculated, the interstates were divided into four tiers with Tier 1 representing the highest interstate segment crash rates. The top three segments for interstates and U.S./MO routes are shown in **Table A-24**. The same process was completed for the U.S. highways and Missouri routes. The results of this analysis are shown in **Figures A-33** and **A-34**.

²¹ Missouri Public Port Authorities: Assessment of Importance and Needs, MoDOT, March 2006.

²² MoDOT 2010-2012 Crash Data, CDM Smith analysis

Appendix A: Assets and Freight Flow Technical Memo

Table A-24: Top Interstate and U.S./MO Route CMV Crash Rate Locations

Top Interstate and U.S./MO Route CMV Crash Rate Locations			
Interstate Segment	Direction	To	From
I-55	North	I-44	I-70
I-55	South	I-70	I-44
I-29	South	I-435 (north)	I-35 split
U.S./MO Route Segment	Direction	To	From
MO 13	South	I-44	US-60
MO 210	East	I-435	MO 291
MO 13	North	US-60	I-44

Source: CDM Smith

There are segments of interstates, mostly within urban areas, that are in Tier 1. Sections of I-70, I-35, I-29, and I-435 in Kansas City are in Tier 1, as are small segments of I-70, I-64, I-55, and I-270 in St. Louis and segments of I-29 and I-229 in St. Joseph. In addition to these urban areas, there is a segment of I-44 near the Oklahoma border in Tier 1.

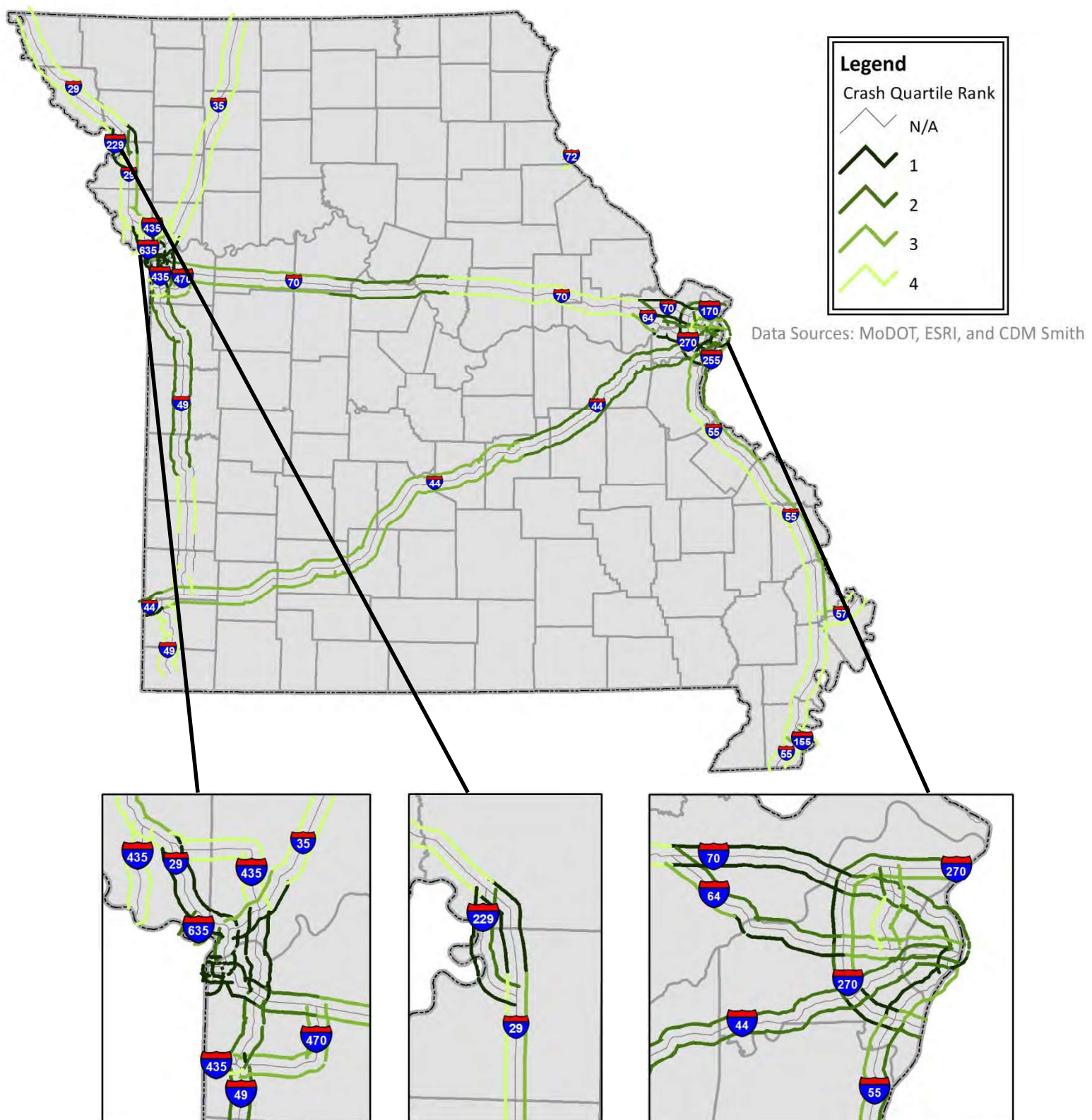
Larger segments of U.S. highways and Missouri routes are also within Tier 1 and, compared to the Interstates, are mostly outside of the urban areas.

- Southbound US-65 from Iowa border to US-54
- US-50 from US-65 to US-54
- Westbound US-50 from US-54 to I-44
- Southbound US-63 from US-50 to Arkansas border
- Eastbound US-60 from Oklahoma border to US-65
- MO 13 from US-54 to US-65

In addition, small segments of US-67 and US-50 in St. Louis and US-71 and MO-210 in Kansas City are in Tier 1.

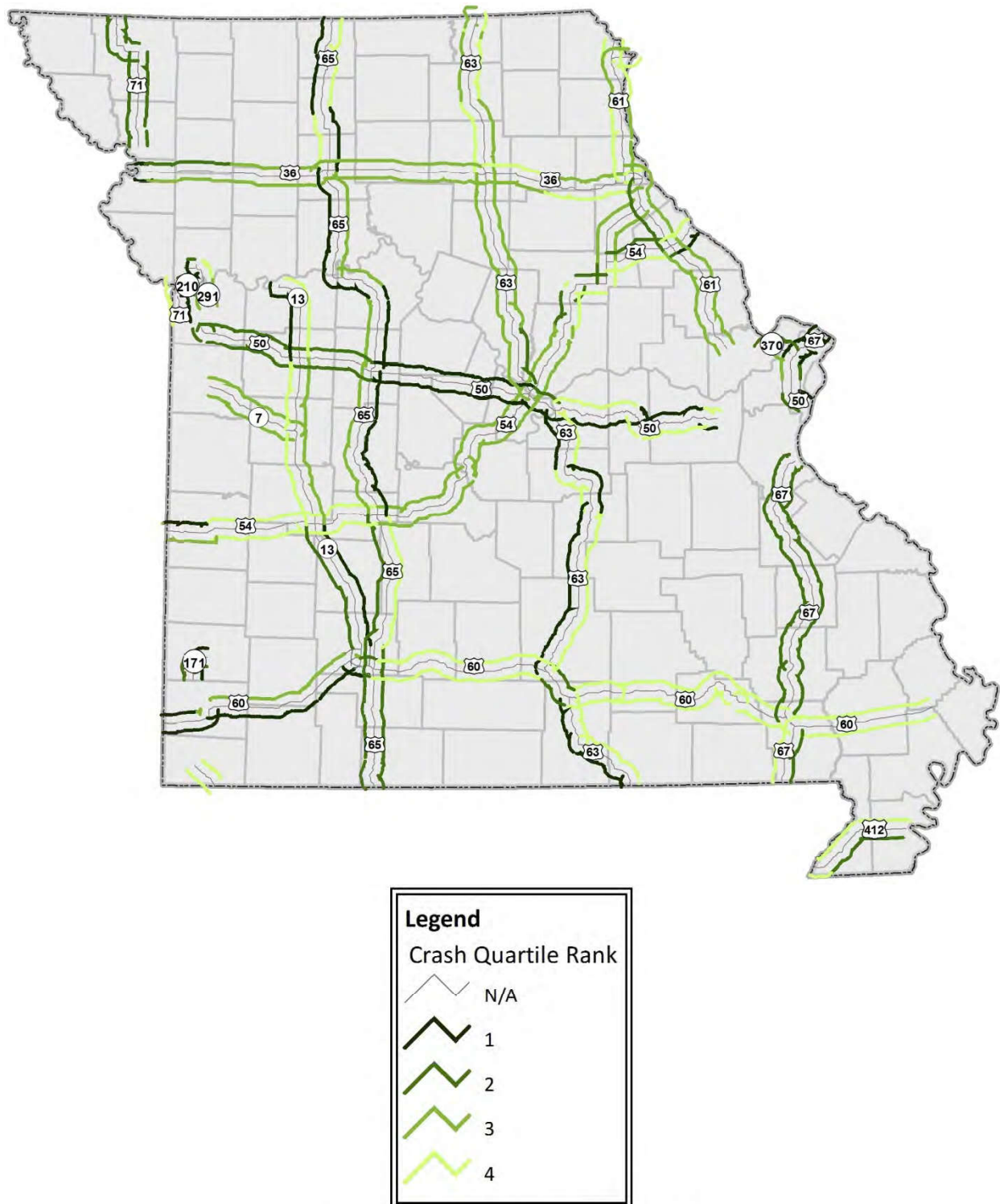
Appendix A: Assets and Freight Flow Technical Memo

Figure A-33: Crash Rates on Interstates in Missouri



Appendix A: Assets and Freight Flow Technical Memo

Figure A-34: Crash Rates on U.S. Highways and Missouri Routes



Data Sources: MoDOT, ESRI, and CDM Smith

Appendix A: Assets and Freight Flow Technical Memo

Freight Flows and Forecasts

This section discusses the existing Missouri freight and commodity flows, as well as the forecasted 2030 flows. The commodity flows are discussed by mode of transportation.

A vast amount of freight traverses Missouri's infrastructure annually. Such freight includes finished goods, materials, and supplies. Central issues concerning freight are: identifying the movements most important to Missouri, and identifying options to facilitate/support them. Identifying the importance of, and solutions for, freight issues comprises several perspectives: volumes (especially compared to capacity), values, related economic impacts, and public perception. TRANSEARCH® data provides Missouri-related movements by mode, direction, and commodity, and by tonnage, units, and value. The full TRANSEARCH report is located in Attachment D.

Freight tonnage across the Missouri freight network is forecast to grow 37.3 percent from 2011 to 2030 (1.7 percent annually), as summarized in **Table A-25**. Truck and rail are by far the dominant modes of freight transportation in Missouri. Truck movements account for 49 percent of the total tonnage and rail movements account for 45 percent. Truck growth is forecast to grow by 55.5 percent (2.4 percent annually), from 500.4 million tons in 2011 to 778.1 million in 2030, a 277.7 million ton increase. In the context of the aggregate 378.8 million ton growth forecast for all combined modes, this 277.7 million increase in truck constitutes 73.3 percent, about half of which is attributable to through movements. While rail growth is forecast to grow by 19 percent (0.9 percent annually), from 458.1 million tons in 2011 to 545.2 million tons in 2030, it still constitutes 40 percent of the total tonnage moved through Missouri.

Through movements are the dominant direction of freight movement in Missouri. They represent 59 percent of all tonnage and are forecast to exhibit the largest percentage growth (73.0 percent, or 2.9 percent annually). This is a significant increase and in perspective, through traffic is projected to increase in absolute tonnage terms (204.8 million) in excess of all the three other directions combined (174.0 million).

Appendix A: Assets and Freight Flow Technical Memo

Table 25: Tonnage Forecast by Mode and Direction, 2011 to 2030

Direction	Air	Pipe	Rail	Truck	Water	Total
2011						
Outbound	34,313	N/A	21,510,433	75,301,621	19,973,291	116,819,658
Inbound	38,249	932,258	92,326,793	89,250,507	5,093,847	187,641,654
Intra	370	N/A	2,436,087	105,627,915	4,941,503	113,005,875
Through	71	7,412,827	341,805,597	230,212,488	19,850,043	599,281,026
Total	73,003	8,345,085	458,078,910	500,392,531	49,858,684	1,016,748,213
2030						
Outbound	54,382	N/A	35,366,325	108,430,027	25,917,689	169,768,423
Inbound	84,077	993,713	90,178,404	129,095,659	5,906,771	226,258,624
Intra	726	N/A	3,237,194	182,656,763	9,565,245	195,459,929
Through	112	7,896,550	416,384,127	357,953,967	21,865,151	804,099,907
Total	139,296	8,890,264	545,166,049	778,136,417	63,254,857	1,395,586,882
Annual % Growth						
Outbound	2.5%	N/A	2.7%	1.9%	1.4%	2.0%
Inbound	4.2%	0.3%	-0.1%	2.0%	0.8%	1.0%
Intra	3.6%	N/A	1.5%	2.9%	3.5%	2.9%
Through	2.4%	0.3%	1.0%	2.4%	0.5%	1.6%
Total	3.5%	0.3%	0.9%	2.4%	1.3%	1.7%
Total % Growth						
Outbound	58.5%	N/A	64.4%	44.0%	29.8%	45.3%
Inbound	119.8%	6.6%	-2.3%	44.6%	16.0%	20.6%
Intra	96.2%	N/A	32.9%	72.9%	93.6%	73.0%
Through	56.8%	6.5%	21.8%	55.5%	10.2%	34.2%
Total	90.8%	6.5%	19.0%	55.5%	26.9%	37.3%
Tonnage Growth						
Outbound	20,068	N/A	13,855,892	33,128,407	5,944,398	52,948,764
Inbound	45,828	61,455	(2,148,389)	39,845,152	812,925	38,616,971
Intra	356	N/A	801,107	77,028,848	4,623,743	82,454,054
Through	40	483,724	74,578,530	127,741,479	2,015,108	204,818,881
Total	66,293	545,179	87,087,139	277,743,886	13,396,173	378,838,670

Source: TRANSEARCH Data, 2011

Truck Commodity Flows

Missouri truck movements in 2011 totaled 500.4 million tons, were valued at \$710.9 billion, and carried 40.6 million units (Table A-26). On average, total truck commodity movements are valued at \$1,421 per ton. Truck movements represent 49.2 percent of modal tonnage in Missouri and 59.0 percent of total modal value in 2011, the largest relative share.

Appendix A: Assets and Freight Flow Technical Memo

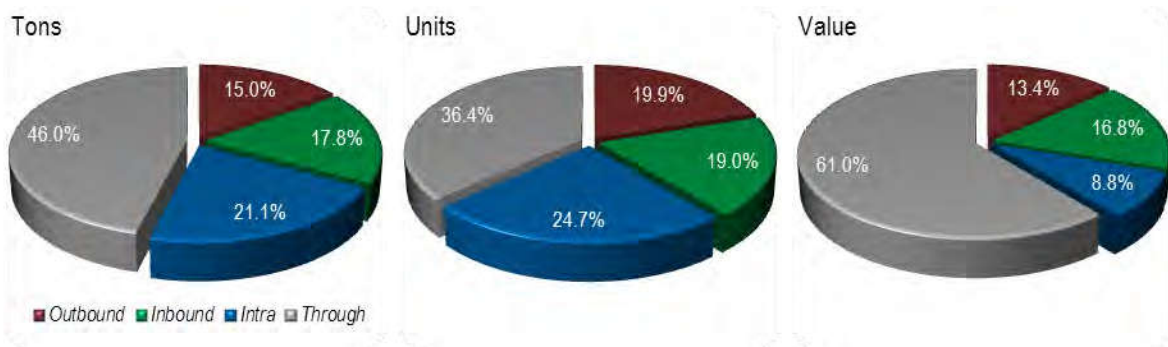
Table A-26: Truck by Direction, 2011

Direction	Tons		Units		Value (in millions)		Average Value/Ton
	Amount	Percent	Amount	Percent	Amount	Percent	
Outbound	75,301,621	15.0%	8,088,079	19.9%	\$95,005	13.4%	\$1,262
Inbound	89,250,507	17.8%	7,725,094	19.0%	\$119,731	16.8%	\$1,342
Intra	105,627,915	21.1%	10,029,099	24.7%	\$62,346	8.8%	\$590
Through	230,212,488	46.0%	14,805,680	36.4%	\$433,794	61.0%	\$1,884
Total	500,392,531	100.0%	40,647,951	100.0%	\$710,876	100.0%	\$1,421

Source: TRANSEARCH Data, 2011

As depicted in **Figure A-35**, through truck movements are the largest directional movements, comprising 46.0% of total tonnage, 36.4% of units, and 61.0% of value. Outbound, inbound, and intrastate movements comprise a remaining 270.2 million tons (54.0%), valued at \$277.1 billion (39.0%).

Figure A-35: Truck Percentages by Direction, 2011



Source: TRANSEARCH Data, 2011

The major truck freight corridors include the major interstates (I-44, I-55, I-70, I-35, and I-29), as seen in **Figure A-36**. Additionally, major U.S. and State highways in the urban centers also accommodate significant freight movements (e.g., US-61 and US-71). The top truck commodity movements by direction are identified in the respective subsections. In terms of all truck directions combined, **Table A-27** shows the top five commodities:

Appendix A: Assets and Freight Flow Technical Memo

Table A-27: Top Truck Commodities

Commodity by Tonnage	Tons (in millions)	Percent
Non-Metallic Materials	102.4	20.5%
Secondary Traffic	84.0	16.8%
Farm Products	82.2	16.4%
Food or Kindred Products	57.5	11.5%
Chemicals or Allied Products	41.8	8.4%
Commodity by Units	Units (in millions)	Percent
Shipping Containers	15.7	38.6%
Farm Products	4.9	12.1%
Secondary Traffic	4.4	10.9%
Nonmetallic Minerals	4.2	10.4%
Food or Kindred Products	2.5	6.2%
Commodity by Value	Value (in billions)	Percent
Secondary Traffic	\$161.7	22.7%
Chemicals or Allied Products	\$73.0	10.3%
Food or Kindred Products	\$71.0	10.0%
Machinery	\$53.2	7.5%
Transportation Equipment	\$50.3	7.1%

Source: TRANSEARCH Data, 2011

Appendix A: Assets and Freight Flow Technical Memo

Figure A-36: Truck Density, 2011



Appendix A: Assets and Freight Flow Technical Memo

Truck Outbound

The outbound truck commodities from Missouri, in 2011, totaled 75.3 million tons (15.0% of directional movements), via 8.1 million units (19.9%), and were valued at \$95.0 billion (13.4%), with an average value/ton of \$1,262. The top five outbound truck commodities are shown in Table A-28:

Table A-28: Top Outbound Truck Commodities

Commodity by Tonnage	Tons (in millions)	Percent
Farm Products	17.9	23.8%
Non-Metallic Materials	14.4	19.1%
Secondary Traffic	11.3	14.9%
Food or Kindred Products	10.5	14.0%
Chemicals or Allied Products	3.3	4.4%
Commodity by Units	Units (in millions)	Percent
Shipping Containers	4.2	52.1%
Farm Products	1.1	13.6%
Secondary Traffic ²³	0.6	7.7%
Nonmetallic Minerals	0.6	7.3%
Food or Kindred Products	0.5	5.7%
Commodity by Value	Value (in billions)	Percent
Secondary Traffic	\$23.1	24.3%
Food or Kindred Products	\$14.2	14.9%
Farm Products	\$9.2	9.7%
Chemicals or Allied Products	\$9.2	9.6%
Machinery	\$7.5	7.9%

Source: TRANSEARCH Data, 2011

²³ Traffic that is being delivered from a warehouse or distribution center.

Appendix A: Assets and Freight Flow Technical Memo

Outbound Tonnage Origin

The major outbound truck tonnages in 2011 are shown by county origin below. Truck movements destined out-of-state are primarily traveling from Jackson County (7.3 million, 9.8%), St. Louis County (7.1 million, 9.4%), and St. Louis City (6.1 million, 8.1%).

Jackson County:

1. Secondary Traffic (3.4 million tons, 46.4% of outbound county total)
2. Food or Kindred Products (0.9 million, 12.1%)
3. Nonmetallic Minerals (0.6 million, 8.8%)

St. Louis County:

1. Nonmetallic Minerals (3.3 million tons, 46.7% of outbound county total)
2. Food or Kindred Products (0.8 million, 11.7%)
3. Secondary Traffic (0.8 million, 10.9%)

St. Louis City:

1. Secondary Traffic (3.3 million tons, 54.9% of outbound county total)
2. Food or Kindred Products (1.0 million, 16.3%)
3. Waste or Scrap Materials (0.6 million, 9.4%)

Outbound Tonnage Destination

The major outbound truck tonnages in 2011 are shown by state. Truck movements destined out-of-state are primarily traveling to Illinois (18.1 million, 24.0%), Kansas (12.7 million, 16.8%), and Arkansas (7.2 million, 9.6%).

Illinois:

1. Nonmetallic Minerals (7.1 million tons, 39.3% of outbound state total)
2. Farm Products (5.1 million, 28.0%)
3. Secondary Traffic (1.8 million, 9.7%)

Kansas:

1. Nonmetallic Minerals (3.9 million tons, 31.0% of outbound state total)
2. Secondary Traffic (2.1 million, 16.8%)
3. Farm Products (1.7 million, 13.5%)

Arkansas:

1. Nonmetallic Minerals (2.5 million tons, 34.6% of outbound state total)
2. Farm Products (1.8 million, 24.7%)
3. Food or Kindred Products (1.0 million, 14.3%)

Appendix A: Assets and Freight Flow Technical Memo

Truck Inbound

The inbound truck commodities to Missouri in 2011 totaled 89.3 million tons (17.8% of directional movements), via 7.7 million units (19.0%), and were valued at \$119.7 billion (16.8%), with an average value/ton of \$1,342 . The top five inbound truck commodities are shown in Table A-29.

Table A-29: Top Inbound Truck Commodities

Commodity by Tonnage	Tons (in millions)	Percent
Farm Products	20.1	22.6%
Secondary Traffic	14.6	16.4%
Non-Metallic Materials	13.8	15.4%
Petroleum or Coal Products	10.6	11.9%
Food or Kindred Products	8.3	9.3%
Commodity by Units	Units (in millions)	Percent
Shipping Containers	3.2	41.2%
Farm Products	1.2	16.0%
Secondary Traffic	0.8	9.8%
Nonmetallic Minerals	0.6	7.3%
Petroleum or Coal Products	0.4	5.7%
Commodity by Value	Value (in billions)	Percent
Secondary Traffic	\$27.9	23.3%
Farm Products	\$11.7	9.8%
Petroleum or Coal Products	\$10.9	9.1%
Food or Kindred Products	\$10.0	8.4%
Transportation Equipment	\$9.9	8.3%

Source: TRANSEARCH Data, 2011

Inbound Tonnage Origin

The major inbound truck tonnages in 2011 are shown by state origin below. Truck movements originating out-of-state are primarily traveling from Illinois (22.1 million, 24.7%), Kansas (17.4 million, 19.5%), and Iowa (7.9 million, 8.8%).

Illinois:

1. Nonmetallic Minerals (6.8 million tons, 30.7% of inbound state total)
2. Petroleum or Coal Products (3.9 million, 17.5%)
3. Farm Products (3.8 million, 17.4%)

Appendix A: Assets and Freight Flow Technical Memo

Kansas:

1. Petroleum or Coal Products (4.6 million tons, 26.4% of inbound state total)
2. Nonmetallic Minerals (4.3 million, 24.6%)
3. Secondary Traffic (3.8 million, 21.6%)

Iowa:

1. Farm Products (4.3 million tons, 55.1% of inbound state total)
2. Nonmetallic Minerals (1.1 million, 14.2%)
3. Food or Kindred Products (0.8 million, 9.6%)

Inbound Tonnage Destination

The major inbound truck tonnages in 2011 are shown by county destination below. Truck movements originating out-of-state are primarily traveling to Jackson County (13.0 million, 14.6%), St. Louis County (11.4 million, 12.8%), and St. Louis City (9.7 million, 10.9%).

Jackson County:

1. Petroleum or Coal Products (3.2 million tons, 24.9% of inbound county total)
2. Secondary Traffic (2.9 million, 22.3%)
3. Nonmetallic Minerals (2.2 million, 16.9%)

St. Louis County:

1. Secondary Traffic (2.4 million tons, 21.2% of inbound county total)
2. Nonmetallic Minerals (1.8 million, 16.0%)
3. Petroleum or Coal Products (1.5 million, 12.7%)

St. Louis City:

1. Secondary Traffic (2.1 million tons, 21.8% of inbound county total)
2. Petroleum or Coal Products (2.0 million, 21.0%)
3. Farm Products (1.9 million, 19.8%)

Truck Intrastate

The intrastate truck commodities within Missouri in 2011 totaled 105.6 million tons (21.1% of directional movements), via 10.0 million units (24.7%), and were valued at \$62.3 billion (8.8%), with an average value/ton of \$590. **Table A-30** identifies the top five intrastate truck commodities within Missouri.

Appendix A: Assets and Freight Flow Technical Memo

Table A-30: Top Truck Commodities Within Missouri

Commodity by Tonnage	Tons (in millions)	Percent
Non-Metallic Materials	65.5	62.0%
Secondary Traffic	14.7	13.9%
Farm Products	11.5	10.8%
Clay, Concrete, Glass or Stone	4.4	4.2%
Waste or Scrap Materials	2.3	2.2%
Commodity by Units	Units (in millions)	Percent
Shipping Containers	5.2	51.5%
Non-Metallic Materials	2.7	26.9%
Secondary Traffic	0.9	8.7%
Farm Products	0.6	5.9%
Clay, Concrete, Glass or Stone	0.3	2.8%
Commodity by Value	Value (in billions)	Percent
Secondary Traffic	\$42.2	67.6%
Farm Products	\$7.6	12.2%
Food or Kindred Products	\$3.1	5.0%
Chemicals or Allied Products	\$2.1	3.4%
Petroleum or Coal Products	\$1.0	1.6%

Source: TRANSEARCH Data, 2011

Truck Through

The through truck commodities moving across Missouri in 2011 totaled 230.2 million tons (46.0% of directional movements), via 14.8 million units (36.4%), and were valued at \$433.8 billion (61.0%), with an average value/ton of \$1,884. Table A-31 displays the top five through truck commodities.

Appendix A: Assets and Freight Flow Technical Memo

Table A-31: Top Through Truck Commodities

Commodity by Tonnage	Tons (in millions)	Percent
Secondary Traffic	43.4	18.8%
Food or Kindred Products	36.5	15.9%
Chemicals or Allied Products	34.6	15.0%
Farm Products	32.7	14.2%
Petroleum or Coal Products	20.4	8.8%
Commodity by Units	Units (in millions)	Percent
Shipping Containers	3.1	21.0%
Secondary Traffic	2.2	14.8%
Farm Products	2.0	13.4%
Chemicals or Allied Products	1.7	11.5%
Food or Kindred Products	1.6	10.8%
Commodity by Value	Value (in billions)	Percent
Secondary Traffic	\$68.5	15.8%
Chemicals or Allied Products	\$55.1	12.7%
Food or Kindred Products	\$43.7	10.1%
Machinery	\$39.1	9.0%
Electrical Equipment	\$37.9	8.7%

Source: TRANSEARCH Data, 2011

Rail Commodity Flows

Missouri rail movements in 2011 totaled 458.1 million tons, were valued at \$465.0 billion, and carried 8.2 million units (Table A-32). On average, total rail commodity movements are valued at \$1,015/ton. Rail movements represent 45.1% of modal tonnage in Missouri and 38.6% of total modal value in 2011, the second largest relative share.

Table A-32: Rail by Direction, 2011

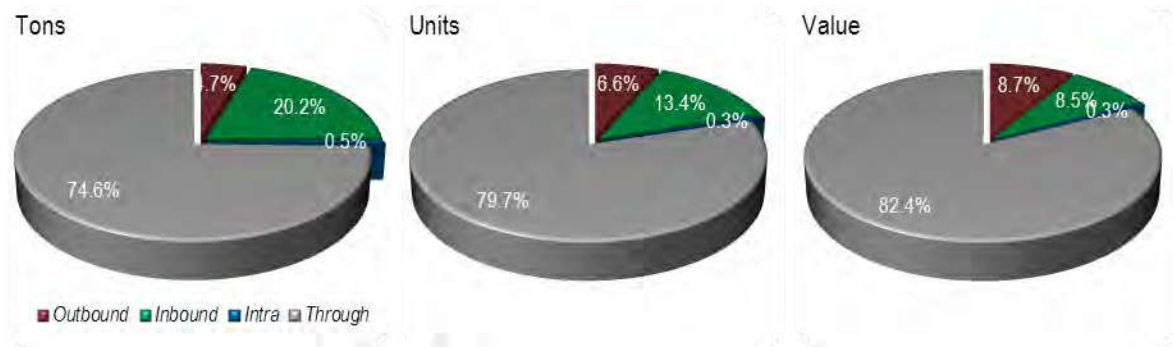
Direction	Tons		Units		Value (in millions)		Average Value/Ton
	Amount	Percent	Amount	Percent	Amount	Percent	
Outbound	21,510,433	4.7%	539,145	6.6%	\$40,364	8.7%	\$1,876
Inbound	92,326,793	20.2%	1,100,284	13.4%	\$39,647	8.5%	\$429
Intra	2,436,087	0.5%	25,780	0.3%	\$1,616	0.3%	\$663
Through	341,805,597	74.6%	6,554,377	79.7%	\$383,409	82.4%	\$1,122
Total	458,078,910	100.0%	8,219,586	100.0%	\$465,035	100.0%	\$1,015

Source: TRANSEARCH Data, 2011

As depicted in Figure A-37, through rail movements dominate directional movements: 74.6% of total tonnage, 79.7% of units, and 82.4% of value. Outbound, inbound, and intrastate movements, combined, comprise the remaining 25.4% of tons and 17.6% of value.

Appendix A: Assets and Freight Flow Technical Memo

Figure A-37: Rail Percentages by Direction, 2011



Source: TRANSEARCH Data, 2011

Major rail freight corridors include routes served by the major Class 1 carriers, especially surrounding Kansas City, as seen in **Figure A-38**; routes with the densest rail traffic include the Union Pacific line between Kansas City and St. Louis and the Burlington Northern-Santa Fe lines connecting Kansas City and Chicago, and between Kansas City and Wyoming (via Nebraska). The top rail commodity movements by direction are identified in the respective subsections. **Table A-33** lists the top five commodities for rail for all directions.

Appendix A: Assets and Freight Flow Technical Memo

Table A-33: Top Rail Commodities

Commodity by Tonnage	Tons (in millions)	Percent
Coal	223.9	48.9%
Food or Kindred Products	39.3	8.6%
Chemicals or Allied Products	38.2	8.3%
Miscellaneous Mixed Shipments	37.2	8.1%
Farm Products	36.2	7.9%
Commodity by Units	Units (in millions)	Percent
Miscellaneous Mixed Shipments	2.6	31.9%
Coal	1.9	22.9%
Transportation Equipment	0.7	8.4%
Food or Kindred Products	0.6	6.9%
Farm Products	0.5	6.0%
Commodity by Value	Value (in billions)	Percent
Miscellaneous Mixed Shipments	\$186.9	40.2%
Transportation Equipment	\$111.1	23.9%
Chemicals or Allied Products	\$56.9	12.2%
Food or Kindred Products	\$28.3	6.1%
Primary Metal Products	\$18.2	3.9%

Source: TRANSEARCH Data, 2011

Appendix A: Assets and Freight Flow Technical Memo

Figure A-38: Rail Density, 2011



Appendix A: Assets and Freight Flow Technical Memo

Rail Outbound

The outbound rail commodities from Missouri in 2011 totaled 21.5 million tons (4.7% of directional movements), via 539,145 units (6.6%), and were valued at \$40.4 billion (8.7%), with an average value/ton of \$1,876. **Table A-34** shows the top five outbound rail commodities from Missouri.

Table A-34: Top Outbound Rail Commodities

Commodity by Tonnage	Tons (in millions)	Percent
Food or Kindred Products	5.0	23.2%
Clay, Concrete, Glass or Stone	3.1	14.6%
Farm Products	3.1	14.2%
Miscellaneous Mixed Shipments	2.3	10.5%
Waste of Scrap Materials	2.1	9.7%
Commodity by Units	Units (in 1,000s)	Percent
Miscellaneous Mixed Shipments	173.8	32.2%
Transportation Equipment	115.2	21.4%
Food or Kindred Products	70.9	13.1%
Clay, Concrete, Glass or Stone	32.6	6.0%
Farm Products	29.8	5.5%
Commodity by Value	Value (in billions)	Percent
Transportation Equipment	\$19.4	47.9%
Miscellaneous Mixed Shipments	\$11.2	27.7%
Chemicals or Allied Products	\$3.1	7.6%
Food or Kindred Products	\$2.8	6.9%
Primary Metal Products	\$0.7	1.8%

Source: TRANSEARCH Data, 2011

Outbound Tonnage Origin

The major outbound rail tonnages in 2011 are shown by county origin below. Rail movements destined out-of-state are primarily traveling from Jackson County (10.2 million, 47.3%), St. Louis City (3.0 million, 13.8%), and Ste. Genevieve County (1.5 million, 6.8%).

Jackson County:

1. Food or Kindred Products (3.2 million tons, 31.3% of outbound county total)
2. Miscellaneous Mixed Shipments (1.7 million, 16.7%)
3. Transportation Equipment (1.3 million, 13.2%)

St. Louis City:

1. Waste or Scrap Materials (0.9 million tons, 28.8% of outbound county total)
2. Chemicals or Allied Products (0.7 million, 22.7%)
3. Miscellaneous Mixed Shipments (0.6 million, 19.0%)

Ste. Genevieve County:

1. Clay, Concrete, Glass, or Stone (1.5 million tons, 99.2% of outbound county total)
2. Chemicals or Allied Products (6,320, 0.4%)

Appendix A: Assets and Freight Flow Technical Memo

3. Transportation Equipment (5,520, 0.4%)

Outbound Tonnage Destination

The major outbound rail tonnages in 2011 are shown by state destination below. Rail movements destined out-of-state are primarily traveling to Texas (3.9 million, 18.1%), California (2.0 million, 9.3%), and Illinois (1.4 million, 6.7%).

Texas:

1. Food or Kindred Products (1.8 million tons, 45.3% of outbound state total)
2. Farm Products (0.7 million, 18.1%)
3. Clay, Concrete, Glass, or Stone (0.6 million, 14.8%)

California:

1. Miscellaneous Mixed Shipments (0.7 million tons, 35.7% of outbound state total)
2. Transportation Equipment (0.4 million, 18.7%)
3. Food and Kindred Products (0.3 million, 13.8%)

Illinois:

1. Transportation Equipment (0.3 million tons, 21.3% of outbound state total)
2. Chemicals or Allied Products (0.3 million, 18.1%)
3. Nonmetallic Minerals (0.2 million, 15.1%)

Rail Inbound

The inbound rail commodities to Missouri in 2011 totaled 92.3 million tons (20.2% of directional movements), via 1.1 million units (13.4%), and were valued at \$39.6 billion (8.5%), with an average value/ton of \$429. The top five inbound rail commodities are shown in **Table A-35**.

Appendix A: Assets and Freight Flow Technical Memo

Table A-35: Top Inbound Rail Commodities

Commodity by Tonnage	Tons (in millions)	Percent
Coal	74.0	80.2%
Food or Kindred Products	4.0	4.4%
Farm Products	2.9	3.2%
Chemicals or Allied Products	2.9	3.1%
Transportation Equipment	1.9	2.1%
Commodity by Units	Units (in 1,000s)	Percent
Coal	619.9	56.3%
Miscellaneous Mixed Shipments	150.3	13.7%
Transportation Equipment	103.7	9.4%
Food or Kindred Products	46.1	4.2%
Shipping Containers	35.9	3.3%
Commodity by Value	Value (in billions)	Percent
Transportation Equipment	\$16.0	40.4%
Miscellaneous Mixed Shipments	\$9.2	23.2%
Chemicals or Allied Products	\$3.6	9.0%
Coal	\$2.7	6.8%
Primary Metal Products	\$2.2	5.6%

Source: TRANSEARCH Data, 2011

Inbound Tonnage Origin

The major inbound rail tonnages in 2011 are shown by state origin below. Rail movements originating out-of-state are primarily traveling from Wyoming (74.3 million, 80.5%), Illinois (2.0 million, 2.1%), and North Dakota (1.3 million, 1.4%).

Wyoming:

1. Coal (73.7 million tons, 99.2% of inbound state total)
2. Chemicals or Allied Products (0.4 million, 0.6%)
3. Clay, Concrete, Glass, or Stone (0.2 million, 0.2%)

Illinois:

1. Food or Kindred Products (0.9 million tons, 46.9% of inbound state total)
2. Transportation Equipment (0.2 million, 11.9%)
3. Chemicals or Allied Products (0.2 million, 11.9%)

North Dakota:

1. Farm Products (1.0 million tons, 73.4% of inbound state total)
2. Food or Kindred Products (0.3 million, 24.4%)
3. Chemicals or Allied Products (29,200, 2.2%)

Appendix A: Assets and Freight Flow Technical Memo

Inbound Tonnage Destination

The major inbound rail tonnages in 2011 are shown by county destination below. Rail movements originating out-of-state are primarily traveling to Jackson County (28.4 million, 30.7%), St. Louis City (11.8 million, 12.8%), and Franklin County (11.7 million, 12.6%).

Jackson County:

1. Coal (19.3 million tons, 68.0% of inbound county total)
2. Food or Kindred Products (2.7 million, 9.4%)
3. Miscellaneous Mixed Shipments (1.4 million, 4.8%)

St. Louis City:

1. Coal (7.6 million tons, 64.4% of inbound county total)
2. Farm Products (1.5 million, 12.7%)
3. Chemicals or Allied Products (1.0 million, 8.6%)

Franklin County:

1. Coal (11.6 million tons, 99.8% of inbound county total)
2. Chemicals or Allied Products (7,840, 0.1%)
3. Pulp, Paper, or Allied Products (6,020, 0.1%)

Rail Intrastate

The intrastate rail commodities within Missouri in 2011 totaled 2.4 million tons (0.5% of directional movements), via 25,780 units (0.3%), and were valued at \$1.6 billion (0.3%), with an average value/ton of \$663. **Table A-36** shows the top five intrastate rail commodities within Missouri.

Appendix A: Assets and Freight Flow Technical Memo

Table A-36: Top Rail Commodities Within Missouri

Commodity by Tonnage	Tons (in millions)	Percent
Coal	1.2	50.2%
Clay, Concrete, Glass or Stone	0.5	21.1%
Farm Products	0.2	7.3%
Nonmetallic Minerals	0.2	7.3%
Food or Kindred Products	0.1	5.4%
Commodity by Units	Units (in 1,000s)	Percent
Coal	10.5	40.6%
Clay, Concrete, Glass or Stone	5.2	20.0%
Transportation Equipment	3.1	12.0%
Nonmetallic Minerals	2.2	8.5%
Farm Products	1.7	6.6%
Commodity by Value	Value (in millions)	Percent
Transportation Equipment	\$1,125	69.6%
Chemicals or Allied Products	\$192	11.9%
Clay, Concrete, Glass or Stone	\$86	5.4%
Food or Kindred Products	\$80	4.9%
Coal	\$45	2.8%

Source: TRANSEARCH Data, 2011

Rail Through

The through rail commodities moving across Missouri in 2011 totaled 341.8 million tons (74.6 percent of directional movements), via 6.6 million units (79.7 percent), and were valued at \$383.4 billion (82.4 percent), with an average value/ton of \$1,122. The top five through rail commodities are shown in **Table A-37**.

Appendix A: Assets and Freight Flow Technical Memo

Table A-37: Top Through Rail Commodities

Commodity by Tonnage	Tons (in millions)	Percent
Coal	148.7	43.5%
Chemicals or Allied Products	33.3	9.7%
Miscellaneous Mixed Products	33.1	9.7%
Food or Kindred Products	30.1	8.8%
Farm Products	30.0	8.8%
Commodity by Units	Units (in millions)	Percent
Miscellaneous Mixed Products	2.3	35.0%
Coal	1.3	19.1%
Transportation Equipment	0.5	7.2%
Food or Kindred Products	0.4	6.8%
Farm Products	0.4	6.5%
Commodity by Value	Value (in billions)	Percent
Miscellaneous Mixed Products	\$166.6	43.5%
Transportation Equipment	\$74.6	19.5%
Chemicals or Allied Products	\$50.1	13.1%
Food or Kindred Products	\$23.3	6.1%
Primary Metal Products	\$15.2	4.0%

Source: TRANSEARCH Data, 2011

Waterway and Ports Commodity Flows

Missouri public port (waterborne) movements in 2011 totaled 49.9 million tons and were valued at \$12.5 billion (Table A-38). On average, total port commodity movements are valued at \$252/ton. Port movements represent 4.9 percent or modal tonnage in Missouri and 1.0% of total modal value in 2011, a small proportion relative to the dominant truck and rail modes. This data is reported through the public port authorities only and does not capture commodity flow from the numerous private ports in the State.

Table A-38: Port by Direction, 2011

Direction	Tons		Value (in millions)		Average Value/Ton
	Amount	Percent	Amount	Percent	
Outbound	19,973,291	40.1%	\$3,479	27.7%	\$174
Inbound	5,093,847	10.2%	\$3,083	24.6%	\$605
Intra	4,941,503	9.9%	\$117	0.9%	\$24
Through	19,850,043	39.8%	\$5,870	46.8%	\$296
Total	49,858,684	100.0%	\$12,549	100.0%	\$252

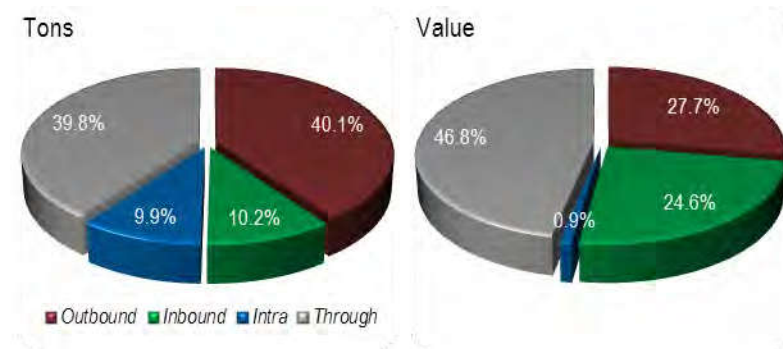
Source: TRANSEARCH Data, 2011

As depicted in Figure A-39, outbound and through tonnage directions constitute the majority of (and proportionally similar) directional movements: 40.1 percent and 39.8 percent, respectively, of total port tonnage. However, in terms of value, the through-based traffic is the relatively largest share, with outbound value not constituting similar percentages relating to tonnage because of the smaller value/ton metric for outbound port movements relative to through port movements. Intrastate

Appendix A: Assets and Freight Flow Technical Memo

port movements are relatively insignificant, but inbound comprises about a quarter of all value, despite a small tonnage percentage (due to relative high value/ton). Unlike truck and rail, unit information was not available for the ports.

Figure A-39: Port Percentages by Direction, 2011



Source: TRANSEARCH Data, 2011

Table A-39 identifies the top five port commodities for all port directions combined.

Table A-39: Top Port Commodities

Commodity by Tonnage	Tons (in millions)	Percent
Coal	12.6	25.3%
Farm Products	10.8	21.7%
Nonmetallic Minerals	8.8	17.6%
Chemicals or Allied Products	4.6	9.2%
Clay, Concrete, Glass or Stone	4.3	8.6%
Commodity by Value	Value (in billions)	Percent
Chemicals or Allied Products	\$3.5	27.8%
Petroleum or Coal Products	\$3.0	24.2%
Farm Products	\$2.1	17.1%
Crude Petroleum or Natural Gas	\$0.7	5.6%
Food or Kindred Products	\$0.6	4.5%

Source: TRANSEARCH Data, 2011

Appendix A: Assets and Freight Flow Technical Memo

Port Outbound

The outbound port commodities from Missouri in 2011 totaled 20.0 million tons (40.1% of directional movements), were valued at \$3.5 billion (27.7%), and had an average value/ton of \$174. The top five outbound port commodities are included in **Table A-40**.

Table A-40: Top Outbound Port Commodities

Commodity by Tonnage	Tons (in millions)	Percent
Coal	6.9	34.7%
Farm Products	4.9	24.6%
Clay, Concrete, Glass or Stone	3.4	16.8%
Nonmetallic Minerals	2.5	12.7%
Chemicals or Allied Products	0.9	4.3%
Commodity by Value	Value (in millions)	Percent
Chemicals or Allied Products	\$976	28.1%
Farm Products	\$960	27.6%
Clay, Concrete, Glass or Stone	\$458	13.2%
Metallic Ores	\$446	12.8%
Coal	\$253	7.3%

Source: TRANSEARCH Data, 2011

Port Inbound

The inbound port commodities to Missouri in 2011 totaled 5.1 million tons (10.2% of directional movements), and were valued at \$3.1 billion (24.6%), with an average value/ton of \$605. **Table A-41** shows the top five inbound port commodities to Missouri

Table A-41: Top Inbound Port Commodities

Commodity by Tonnage	Tons (in millions)	Percent
Chemicals or Allied Products	1.7	33.6%
Petroleum or Coal Products	1.7	32.7%
Nonmetallic Minerals	0.7	13.3%
Metallic Ores	0.5	10.3%
Farm Products	0.2	4.3%
Commodity by Value	Value (in millions)	Percent
Petroleum or Coal Products	\$1,531	49.7%
Chemicals or Allied Products	\$1,192	35.4%
Primary Metal Products	\$164	5.3%
Fabricated Metal Products	\$105	3.4%
Machinery	\$60	2.0%

Source: TRANSEARCH Data, 2011

Port Intrastate

Appendix A: Assets and Freight Flow Technical Memo

The intrastate port commodities within Missouri in 2011 totaled 4.9 million tons (9.9% of directional movements), were valued at \$117 million (0.9%), and had an average value/ton of \$24. The top five intrastate port commodities are displayed in **Table A-42**.

Table A-42: Top Port Commodities Within Missouri

Commodity by Tonnage	Tons (in 1,000s)	Percent
Nonmetallic Minerals	4,261.7	86.2%
Clay, Concrete, Glass or Stone	606.9	12.3%
Chemicals or Allied Products	34.1	0.7%
Petroleum or Coal Products	18.8	0.4%
Farm Products	17.8	0.4%
Commodity by Value	Value (in millions)	Percent
Clay, Concrete, Glass or Stone	\$59	50.0%
Nonmetallic Minerals	\$33	28.4%
Chemicals or Allied Products	\$16	13.9%
Farm Products	\$5	4.2%
Primary Metal Products	\$2	2.0%

Source: TRANSEARCH Data, 2011

Port Through

The through port commodities moving across Missouri in 2011 totaled 19.9 million tons (39.8% of directional movements), were valued at \$5.9 billion (46.8%), and had an average value/ton of \$296. **Table A-43** shows the top five through port commodities moving across Missouri.

Table A-43: Top Through Port Commodities

Commodity by Tonnage	Tons (in millions)	Percent
Coal	5.7	28.7%
Farm Products	5.7	28.7%
Petroleum or Coal Products	2.4	12.0%
Chemicals or Allied Products	2.0	10.1%
Nonmetallic Minerals	1.3	6.4%
Commodity by Value	Value (in billions)	Percent
Petroleum or Coal Products	\$1.5	25.3%
Chemicals or Allied Products	\$1.4	23.8%
Farm Products	\$1.1	19.0%
Crude Petroleum or Natural Gas	\$0.6	10.8%
Food or Kindred Products	\$0.4	6.9%

Source: TRANSEARCH Data, 2011

Appendix A: Assets and Freight Flow Technical Memo

Air Commodity Flows

Missouri air movements in 2011 totaled 73,003 tons, and were valued at \$11.4 billion (Table A-44). On average, total port commodity movements are valued at \$155.974/ton. Air movements represent less than 0.01% of modal tonnage in Missouri and less than 1.0% of total modal value in 2011, a very small proportion relative to other modes.

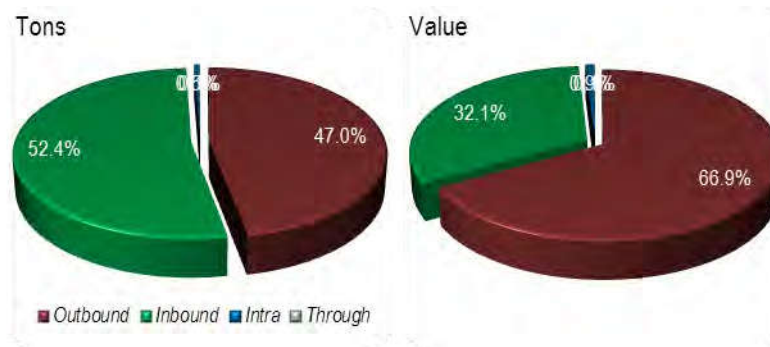
Table A-44: Air by Direction, 2011

Direction	Tons		Value (in millions)		Average Value/Ton
	Amount	Percent	Amount	Percent	
Outbound	34,313	47.0%	\$7,620	66.9%	\$222,085
Inbound	38,249	52.4%	\$3,656	32.1%	\$95,591
Intra	370	0.5%	\$100	0.9%	\$270,224
Through	71	0.1%	\$10	0.1%	\$139,152
Total	73,003	100.0%	\$11,387	100.0%	\$155,974

Source: TRANSEARCH Data, 2011

As depicted in Figure A-40, outbound and inbound tonnage directions constitute the gross majority (and proportionally similar) of directional movements: 47.0% and 52.4%, respectively, of total air tonnage. However, in terms of value, the outbound-based traffic is the relatively largest share, due to the relatively higher value/ton metric for outbound compared to inbound air movements (more than twice as expensive). Intrastate and through air movements are insignificant and effectively dismissible, given the combined total of only 441 tons, valued at \$110 million (as such, commodity details for such modal directions are not delineated in subsections below). Like the ports, unit information was not available for air.

Figure A-40: Air Percentages by Direction, 2011



Source: TRANSEARCH Data, 2011

Appendix A: Assets and Freight Flow Technical Memo

Table A-45 shows the top five air freight commodities.

Table A-45: Top Air Commodities		
Commodity by Tonnage	Tons (in 1,000s)	Percent
Textile Mill Products	13.6	18.6%
Transportation Equipment	9.9	13.5%
Electrical Equipment	9.4	12.8%
Printed Matter	7.4	10.1%
Miscellaneous Manufacturing Products	6.7	9.1%
Commodity by Value	Value (in billions)	Percent
Miscellaneous Manufacturing Products	\$4.1	35.8%
Transportation Equipment	\$2.2	19.6%
Electrical Equipment	\$2.1	18.3%
Chemicals or Allied Products	\$1.1	9.5%
Instruments, Photo Equipment and Optical Equipment	\$0.8	7.0%

Source: TRANSEARCH Data, 2011

Appendix A: Assets and Freight Flow Technical Memo

Air Outbound

The outbound air commodities from Missouri in 2011 totaled 34,313 tons (47.0% of directional movements), and were valued at \$7.6 billion (66.9%), with an average value/ton of \$222.085. The top five outbound air commodities are included in **Table A-46**.

Table A-46: Top Outbound Air Commodities

Commodity by Tonnage	Tons (in 1,000s)	Percent
Transportation Equipment	8.0	23.4%
Miscellaneous Manufacturing Products	5.8	16.8%
Electrical Equipment	4.2	12.1%
Mail or Contract Traffic	2.8	8.1%
Textile Mill Products	2.3	6.7%
Commodity by Value	Value (in billions)	Percent
Miscellaneous Manufacturing Products	\$3.5	46.3%
Transportation Equipment	\$1.8	23.9%
Electrical Equipment	\$0.9	12.1%
Chemicals or Allied Products	\$0.6	7.8%
Instruments, Photo Equipment and Optical Equipment	\$0.3	3.6%

Source: TRANSEARCH Data, 2011

Appendix A: Assets and Freight Flow Technical Memo

Air Inbound

The inbound air commodities to Missouri in 2011 totaled 38,249 tons (52.4% of directional movements), and were valued at \$3.7 billion (32.1%), with an average value/ton of \$95.591. The top five inbound air commodities are included in **Table A-47**.

Table A-47: Top Inbound Air Commodities

Commodity by Tonnage	Tons (in 1,000s)	Percent
Textile Mill Products	11.3	29.5%
Printed Matter	5.8	15.1%
Electrical Equipment	4.9	12.8%
Mail or Contract Traffic	2.6	6.7%
Instruments, Photo Equipment and Optical Equipment	2.5	6.6%
Commodity by Value	Value (in billions)	Percent
Electrical Equipment	\$1.1	30.0%
Instruments, Photo Equipment and Optical Equipment	\$0.5	14.1%
Miscellaneous Manufacturing Products	\$0.5	14.1%
Chemicals or Allied Products	\$0.5	13.2%
Transportation Equipment	\$0.4	11.2%

Source: TRANSEARCH Data, 2011

Pipeline Commodity Flows

Missouri pipeline movements in 2011 totaled 8.3 million tons, and were valued at \$5.8 billion (**Table A-48**). On average, total pipeline commodity movements are valued at \$690/ton. Pipeline movements represent less than 1.0% of modal tonnage in Missouri and 0.5% of total modal value in 2011: the second smallest relative volume and smallest value of the presented modes.

Table A-48: Pipeline by Direction, 2011

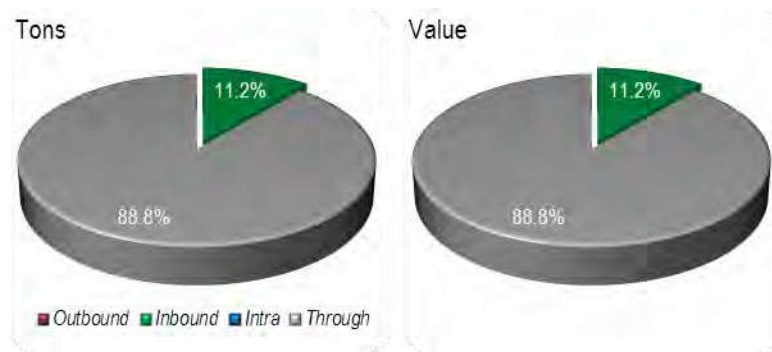
Direction	Tons		Value (in millions)		Average Value/Ton
	Amount	Percent	Amount	Percent	
Outbound	N/A	N/A	N/A	N/A	N/A
Inbound	932,258	11.2%	\$643	11.2%	\$690
Intra	N/A	N/A	N/A	N/A	N/A
Through	7,412,827	88.8%	\$5,117	88.8%	\$690
Total	8,345,085	100.0%	\$5,761	100.0%	\$690

Source: TRANSEARCH Data, 2011

As depicted in **Figure A-41**, only through and inbound tonnage directions exist for pipelines in Missouri, with through constituting the significant majority for both tonnage and value (88.8% of both terms).

Figure A-41: Pipeline Percentages by Direction, 2011

Appendix A: Assets and Freight Flow Technical Memo



Source: TRANSEARCH Data, 2011

Missouri pipeline movements comprise only two Standard Transportation Commodity Classes (STCCs) (Crude Petroleum and Natural Gas, and Petroleum or Coal Products) and two directions (inbound and through). In effect, over 99.9% of all pipeline-related movements are in the STCC: Crude Petroleum and Natural Gas, with an insignificant fraction accounting for Petroleum or Coal Products as an inbound movement. As depicted above, most of the Crude Petroleum and Natural Gas (88.8%) simply flows through Missouri.

Appendix A: Assets and Freight Flow Technical Memo

Conclusions and Next Steps

Missouri's freight system includes a wide variety of assets of varying modes, including highway, rail, air, water and pipeline as well as intermodal facilities and freight generators. The largest of these assets is Missouri's 33,700 miles of roadway. By identifying not only the critical nodes, links, and corridors of the State's freight system, but the system's current condition and performance this analysis will ultimately build the foundation for the assessment of needs of the current freight system.

Missouri is a bridge state; the TRANSEARCH® data confirms this assertion with data indicating that the majority of movements traversing Missouri's transportation network is truck- and rail-based through traffic. The main commodities are rail-based coal and truck-based secondary traffic. It is also projected that the dominance of through-based traffic will increase by 2030, reinforcing the role of Missouri as a bridge state. Of the modes, truck carries the largest relative volume and value followed by rail and then port. Pipeline carries the fourth largest relative volume followed by air; however, air carries the fourth largest by value followed by pipeline.

From a comprehensive tonnage and value perspective, the most important freight movements are through-based movements, carried by truck and rail. Thus it is important to understand the implications of these movements on the freight system in Missouri, as the users of the system are accordingly non-Missouri based. In effect, the freight system in Missouri is serving the necessary needs of others, and Missouri should keep in mind.

The ensuing economic analysis builds upon the freight data presented herein to explain and quantify the importance of freight transport to the Missouri economy. Economic impacts associated with freight go far beyond the impacts associated with freight transport service. A vast majority of freight-related economic impact is associated with the firms that use freight transport to conduct business. To understand such impact, one needs to know the value of freight movements by direction, and how the economy uses such commodities to produce goods and services.

Appendix A

Attachment A: NHS Intermodal Connectors

Appendix A: Attachments A-D

Intermodal Connectors are identified as a component of the NHS by FHWA. They provide the integral connections between major intermodal facilities and the NHS roadways.

NHS INTERMODAL CONNECTORS				
Facility	Type	Connector Description	Connector Length	Facility ID
Burlington Northern, Kansas City	Truck/Rail Facility	1	From I-29/35 (ex 6B): E 5.5 mi on MO-210 to Facility Entrance (same as 8R)	0
Burlington Northern, Kansas City	Truck/Rail Facility	2	From MO-291: SW 4.5 mi on MO-210 to facility entrance (same as 8R)	0
Kansas City Amtrak Station	AMTRAK Station	1	Served by an existing NHS route	0
Kansas City Greyhound Terminal	Intercity Bus Terminal	1	Served by an existing NHS route	0
Kansas City International Airport	Airport	1	From I-29/435 (ex 15): S 1.5 mi on Mexico City Ave to Air Cargo Facility on Paris Street	1.5
Kansas City Southern, Kansas City	Truck/Rail Facility	1	South on Chouteau Frwy from MO-210. Shared connector with 7R	0
Lambert International Airport, St. Louis	Airport	1	Served by an existing NHS route	0
Multiple Ports on MS River, St. Louis	Port Terminal	1	Served by an existing NHS route	0
New Madrid County Port	Port Terminal	1	From I-55: east 0.54 mile on MO-EE and 0.85 mile on Entrance Rd, north 0.52 mile on Port Authority Access Rd and 0.66 mile on Levee Rd, and east 0.43 mile on County Rd 406 to terminal.	3.0
Norfolk Southern/Triple Crown, KC	Truck/Rail Facility	1	From I-29/35 (ex 6B): E 5.5 mi on MO-210 to Facility Entrance	5.5
Norfolk Southern/Triple Crown, KC	Truck/Rail Facility	2	From MO-291: SW 4.5 mi on MO-210 to facility entrance	4.5
Norfolk Southern/Triple Crown, St. Louis	Truck/Rail Facility	1	From I-70 (exit 247): NE 0.3 mi on Grand, NW 1.5 mi on Hall to intermodal facility	1.8
Norfolk Southern/Triple Crown, St. Louis	Truck/Rail Facility	2	From I-270 (exit 34): SW 5.7 mi on Riverdale Dr and continuing on Hall Street to terminal	5.7
Port of St. Louis #2	Port Terminal	1	7th St. (I-55/44 to I-55)	1.8
Semo Port, Scott City	Port Terminal	1	From I-55 (exit 91): Easterly 4.0 mi on MO-AB to entrance to Semo Port	4
Springfield Greyhound Terminal	Intercity Bus Terminal	1	Served by an existing NHS route	0
Springfield Regional Airport	Airport	1	Directly Accessible from NHS	0
St. Louis Amtrak Station	AMTRAK Station	1	Served by an existing NHS route	0
St. Louis Greyhound Station	Intercity Bus Terminal	1	Served by an existing NHS route	0
St. Louis Park & Ride Lot at Metro Link	Public Transit Station	1	From I-70 (exit 239): S 0.3 mi on North Hanley to Metro Link Stop	0.3
Union Pacific, Kansas City	Truck/Rail Facility	1	From MO-210 intermodal connector: S 2.0 mi on Chouteau Trafficway to facility entr on Gardner Ave	2
TOTAL				30.1

Source: http://www.fhwa.dot.gov/planning/national_highway_system/intermodal_connectors/missouri.cfm

Appendix A

Attachment B: Missouri Generators Analysis

Appendix A: Attachments A-D

Introduction

As part of the Missouri Department of Transportation's (MoDOT) State Freight Plan, the American Transportation Research Institute (ATRI) has been tasked with identifying 100 freight generators in Missouri. The following sections present the results of that analysis, which utilized truck GPS probe data from ATRI's Freight Performance Measures (FPM) database.

ATRI Freight Performance Measures (FPM) Database

As background, the ATRI FPM database compiles anonymous trucking operations data from several hundred thousand trucks using GPS data from onboard trucking systems - generating billions of data points annually. Each truck used in FPM analysis has a regular position read (generally every 1 to 15 minutes) and includes information on vehicle location, unique vehicle identification, time/date, and, in many cases, vehicle spot speed (which is obtained from the vehicle's engine).

Through these attributes, ATRI performs spatial queries and relates the FPM truck GPS data to a variety of transportation datasets using customized software and proprietary database management workflows. The ATRI FPM dataset supports studies throughout North America that seek to more fully understand the nature of trucking operations.

Methodology

ATRI analyzed a sample of truck GPS data from Missouri to identify census block groups (CBG) where freight activity is most intense. The output from this analysis provides insight regarding the source locations of freight movement.

The goal of this analysis is to identify geographic locations (at the CBG level) where freight is generated. Such locations include distribution centers, warehouses, manufacturing facilities and other origins and destinations. These locations were identified based on the intensity of truck activity within CBG.

To conduct the analysis a truck GPS dataset was first assembled that included data for four months (February, May, August, and November) in 2013. The dataset was limited to points inside the boundary of Missouri; within Missouri, there were no geographic limitations.

Using a sample of this dataset, ATRI identified 400 freight-significant CBGs out of a total of 4,506 in the state based on truck GPS data activity within each CBG. ATRI's sample included only stopped trucks. This identification allowed the research team to filter the larger statewide dataset and focus only on data from freight generators.

The next step was to identify the 100 most intense freight generators among the 400 CBGs. To do this, a second filter was employed. Data points that fell on major roadways or at truck stops were removed from the dataset using various GIS based filters. After this process, which took advantage of available proprietary GIS layers (e.g. roadway networks), additional manual reviews were conducted using aerial imagery to identify data that fell within a CBG but outside of a freight generator. The end result was a dataset that included only vehicle GPS positions within the vicinity of a freight generator facility. The process resulted in a refined truck position data set that identified, based on number of position reads, a set of 100 top freight generator CBGs.

Next, freight generator tiers were assigned to each CBG based on three categories of analysis. For each category, the 100 CBGs were ranked and assigned to a tier based on their quintile (1-5) within the ranking system, with 1 having the highest level of activity and 5 having the lowest level among the 100 locations.

The first category (A) assigned CBGs to tiers based on the number of truck positions within each CBG.

The second category (B) divides the position count by the area (square miles) of the CBG to produce a standardized intensity value.

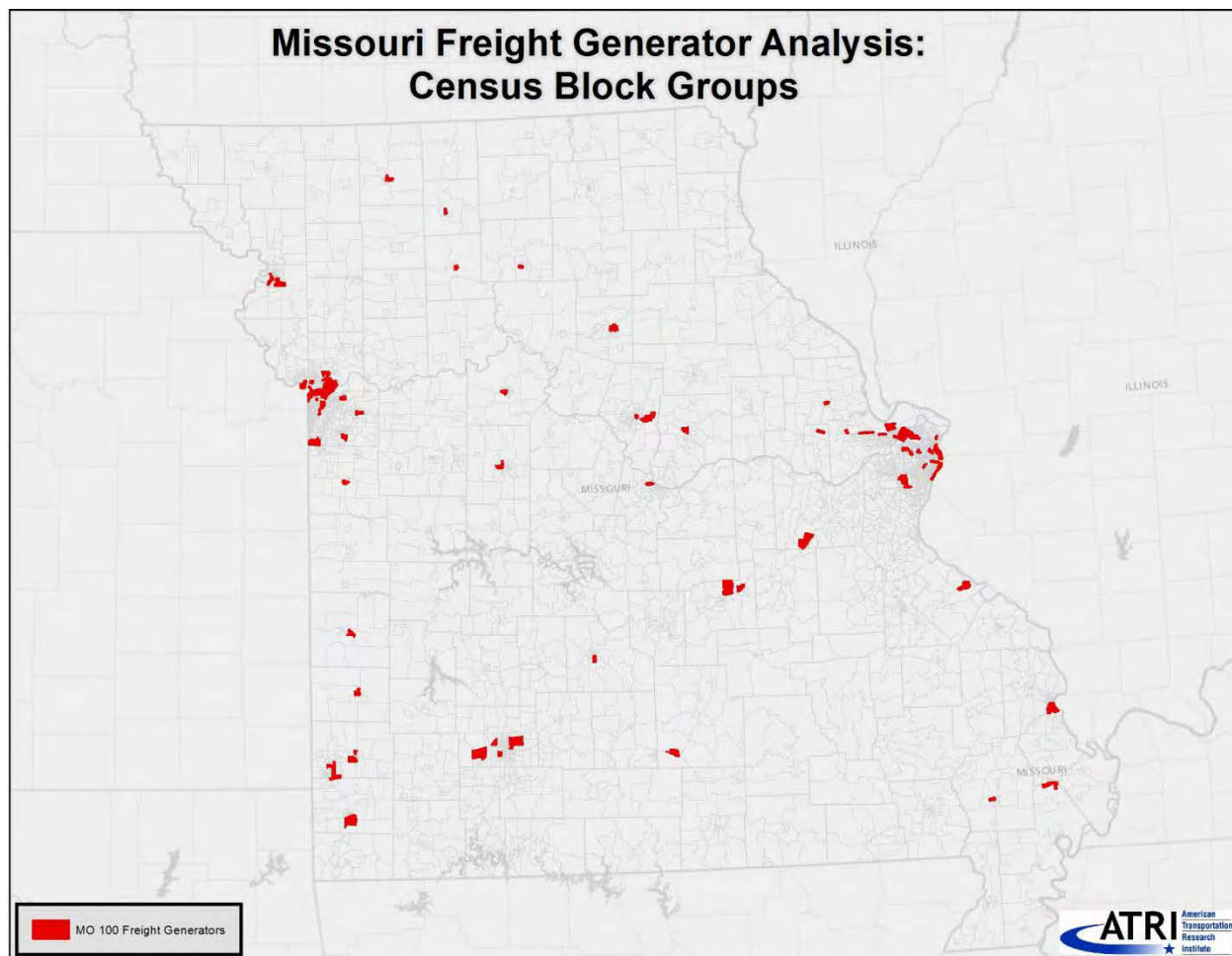
CBGs in category A and category B were assigned a ranking from 1-100 with the greatest value receiving a rank of 1 and the smallest value receiving a rank of 100. The third category (C) averages the ranking from category A and category B to establish a 3rd rank order. Each CBG was then assigned a tier (1-5) for each category based on the ranking within that category.

Appendix A: Attachments A-D

Freight Generators Analysis

Figure A-1 depicts the 100 freight generators identified through this analysis. Each of the 100 locations is shown in red. These locations tend to be near large urban areas and major highways.

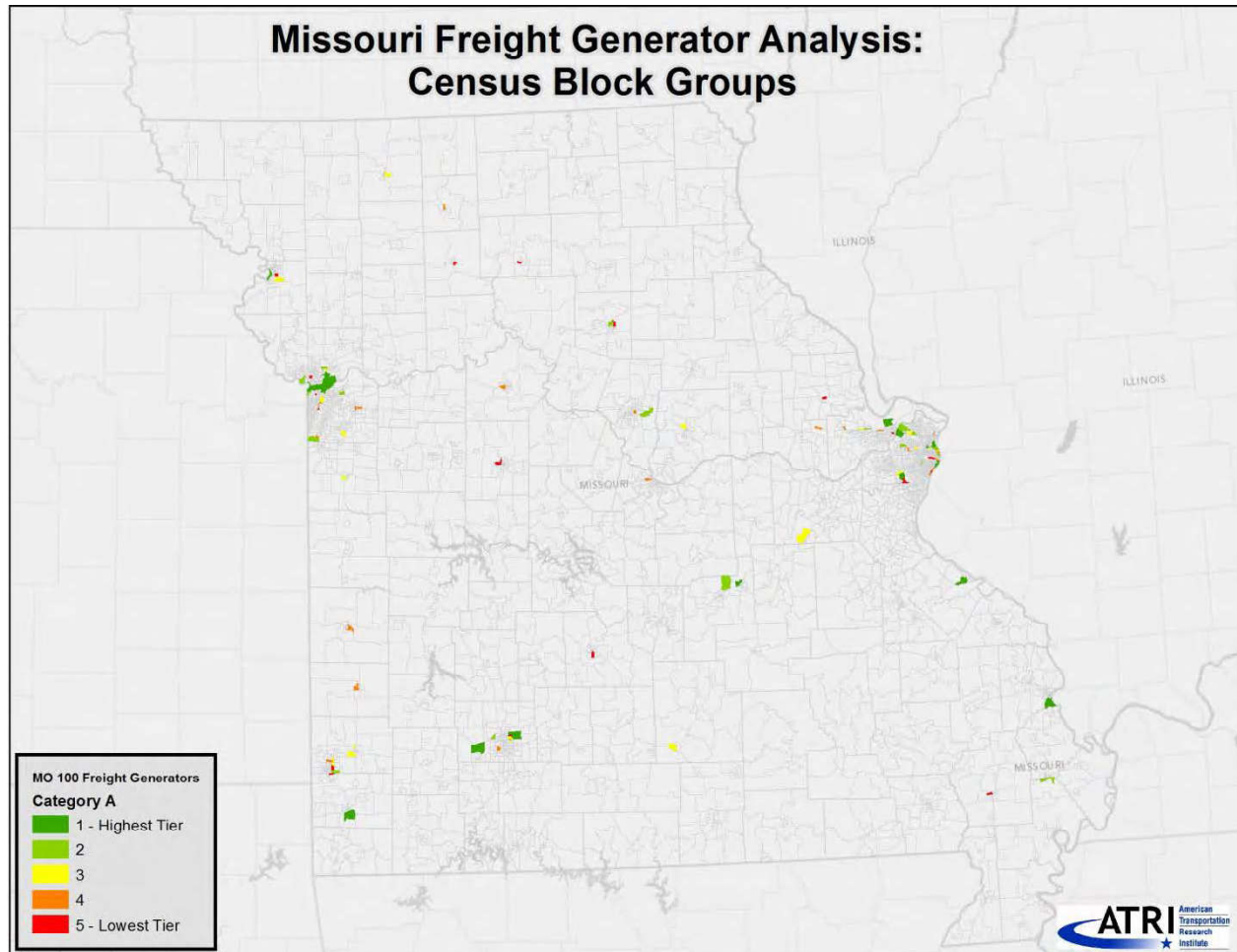
Figure 1: 100 Identified Freight Generators - Census Block Group



Appendix A: Attachments A-D

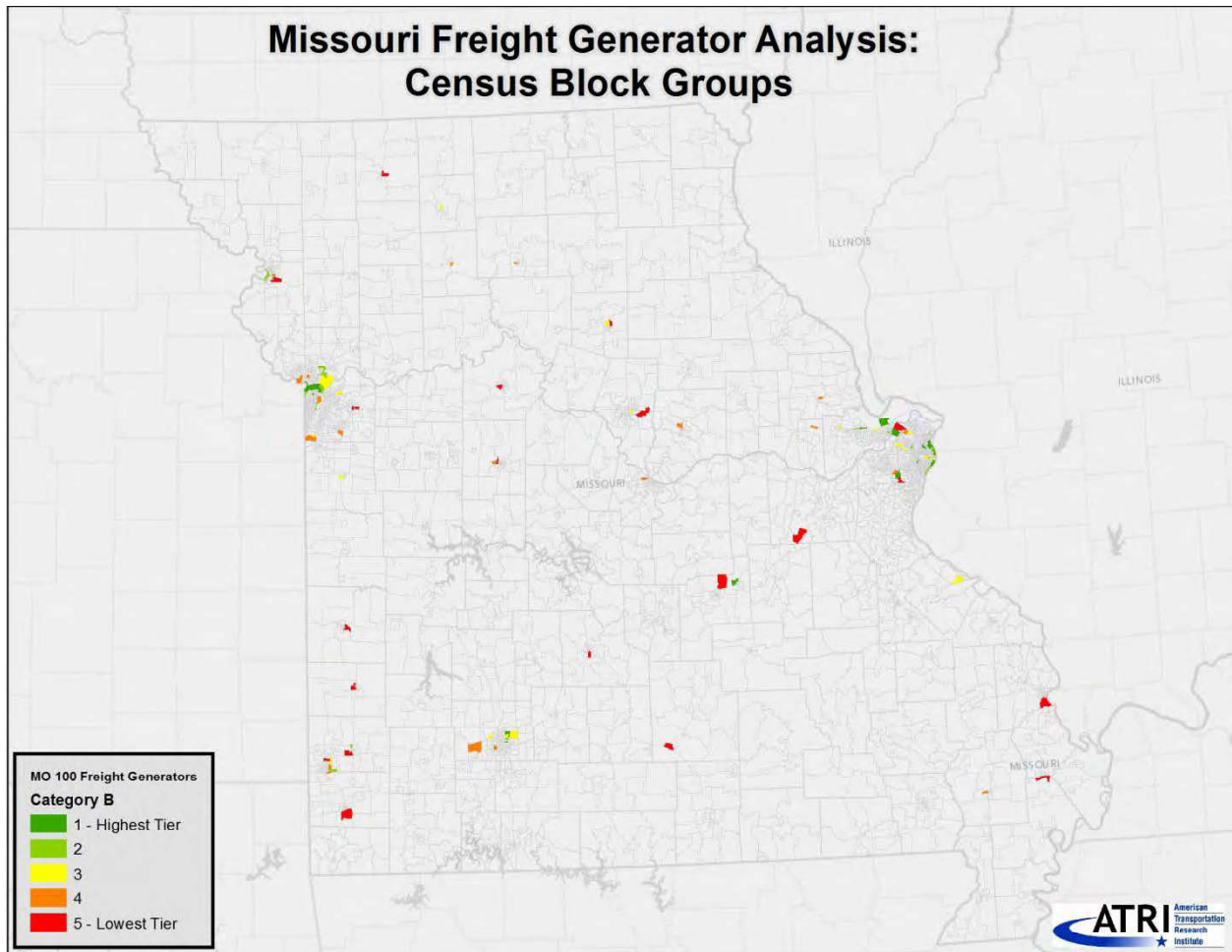
Figures 2, 3 and 4 depict the 100 identified locations and the corresponding freight generator tiers for each category. Tiers are color coded to emphasize the tier segmentation. The highest values (tier 1) are shown in dark green and the lowest values (tier 5) dark red.

Figure 2: 100 Freight Generators - Category A



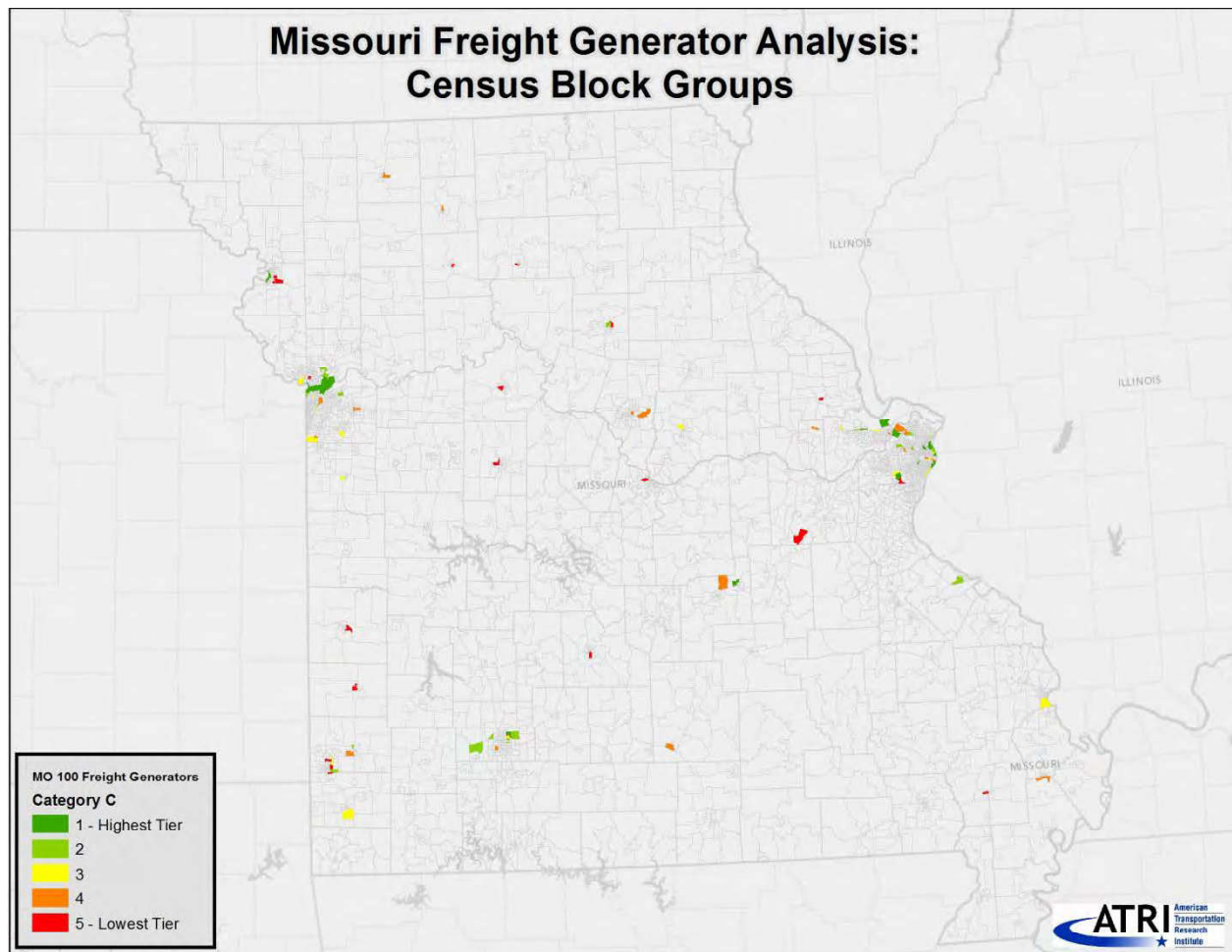
Appendix A: Attachments A-D

Figure 3: 100 Freight Generators - Category B



Appendix A: Attachments A-D

Figure 4: 100 Freight Generators - Category C



The final two figures depict the Category C freight generator locations in greater detail for the Kansas City (Figure 5) and St Louis (Figure 6) metro areas.

Appendix A: Attachments A-D

Figure 5: 100 Freight Generators - Category C, Kansas City Detail

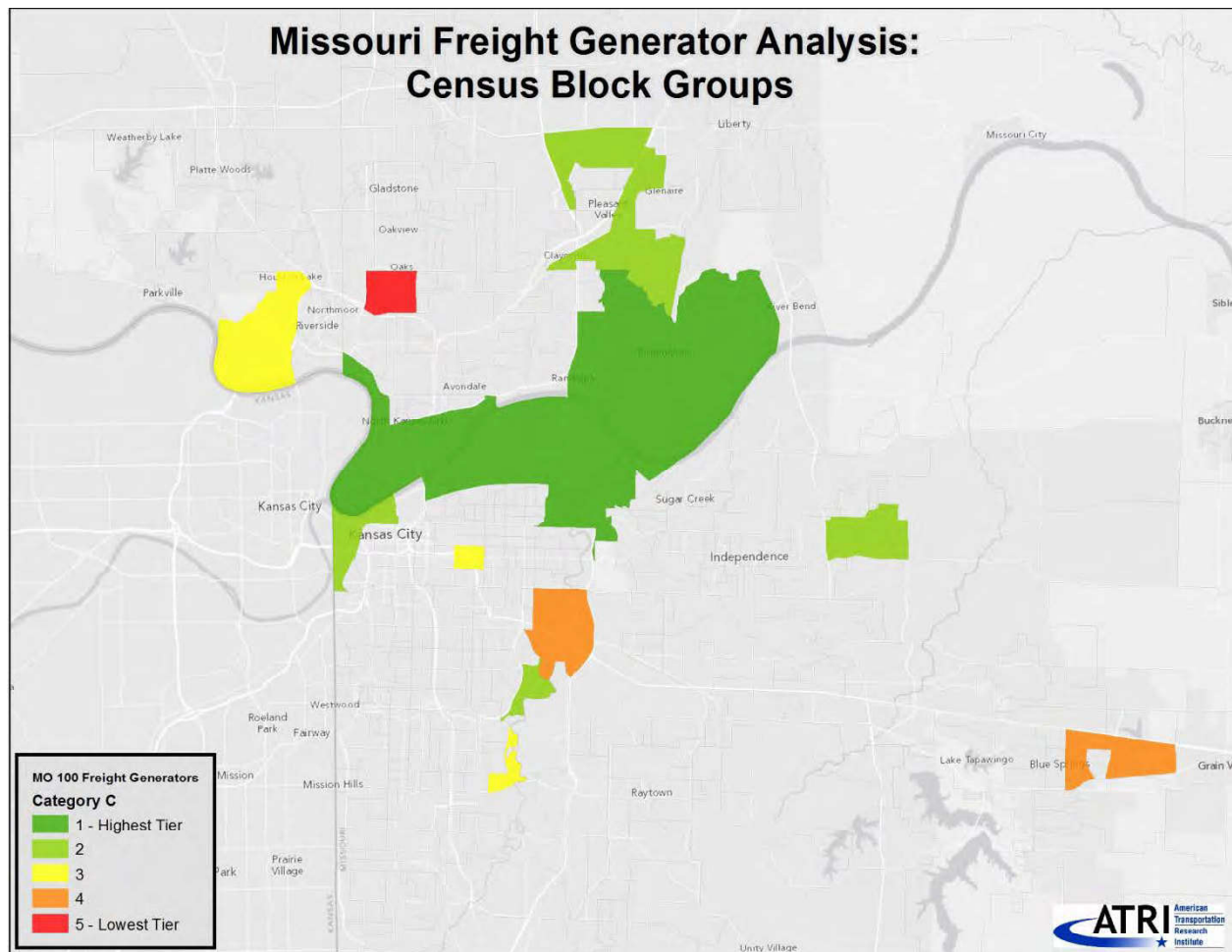
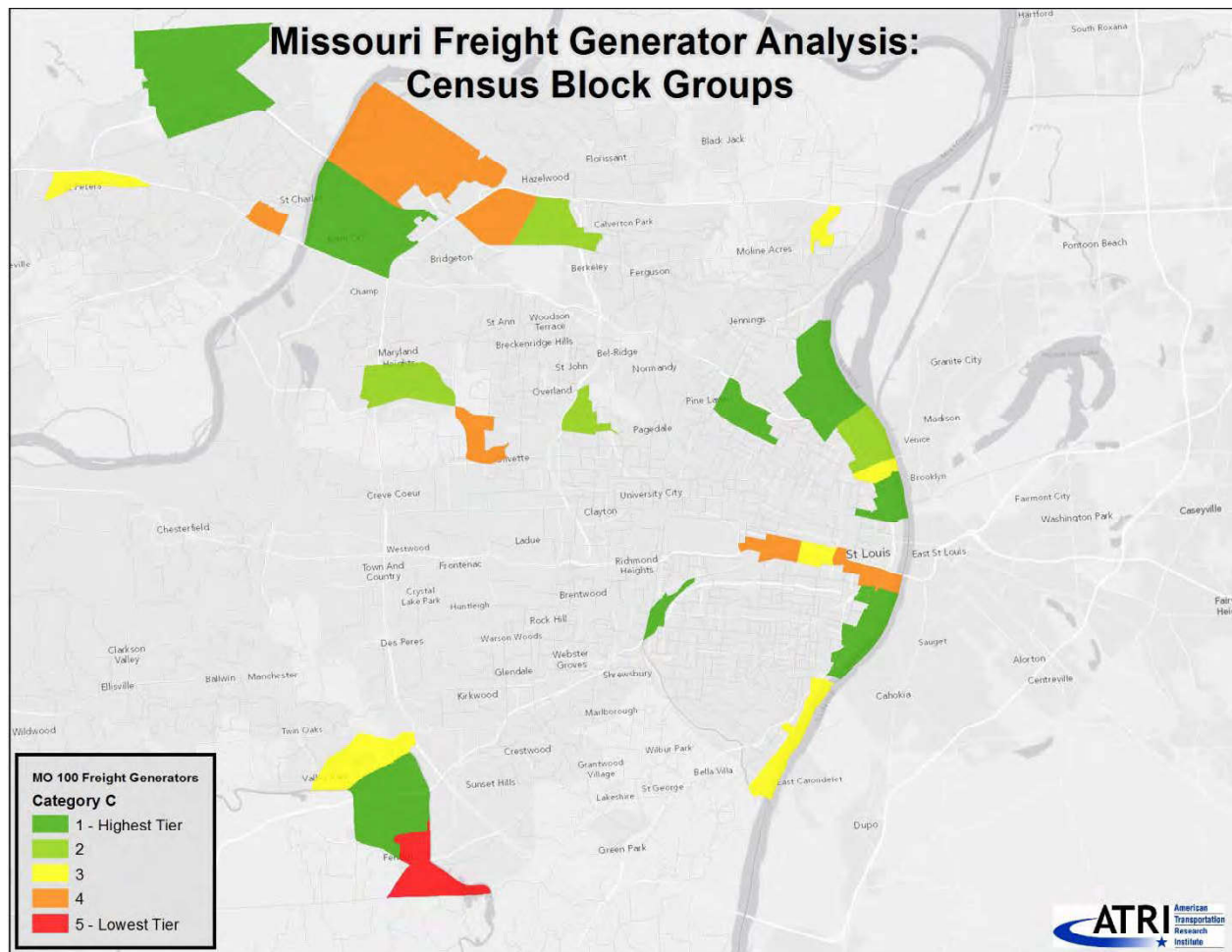
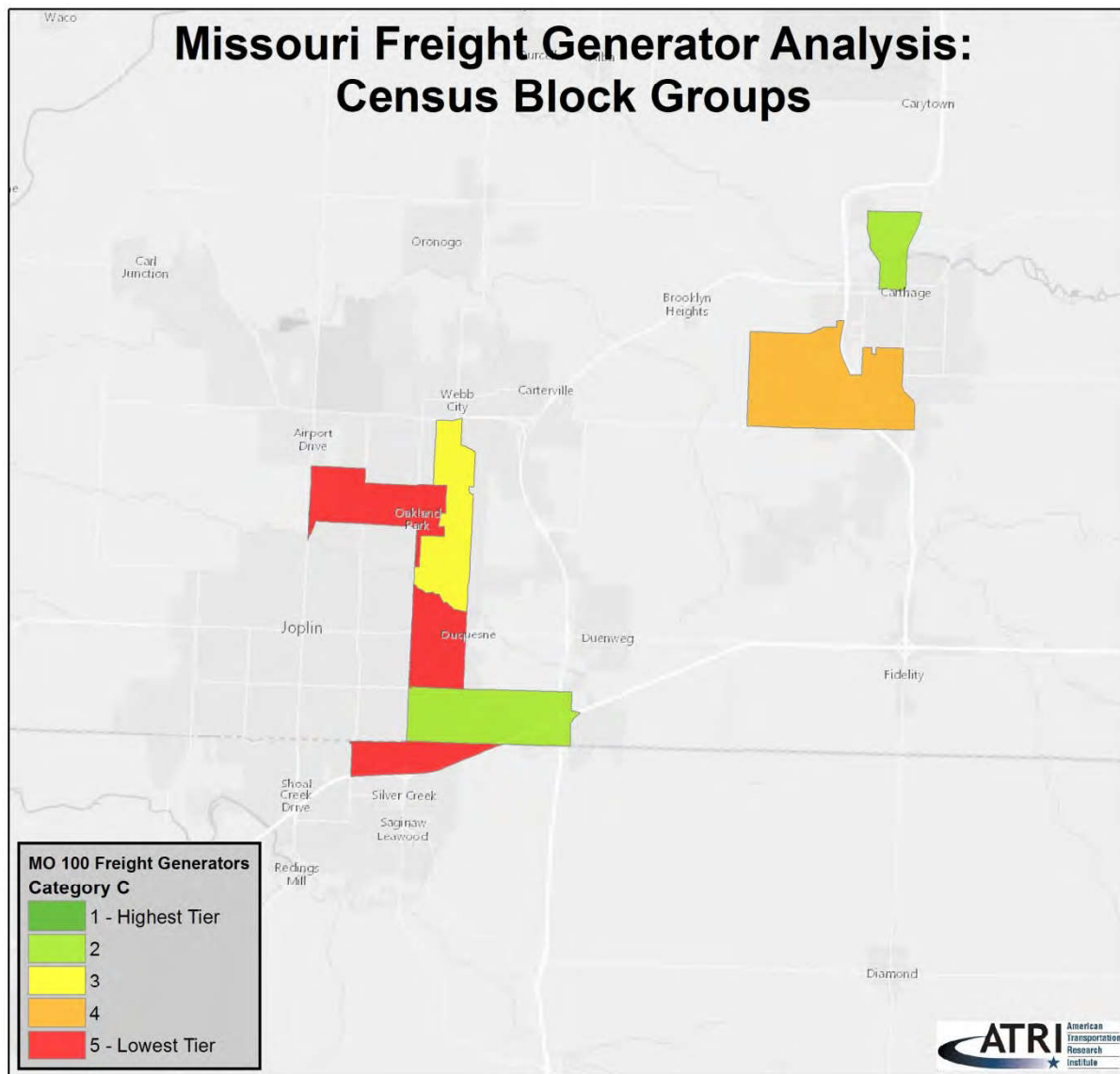


Figure 6: 100 Freight Generators - Category C, St Louis Detail



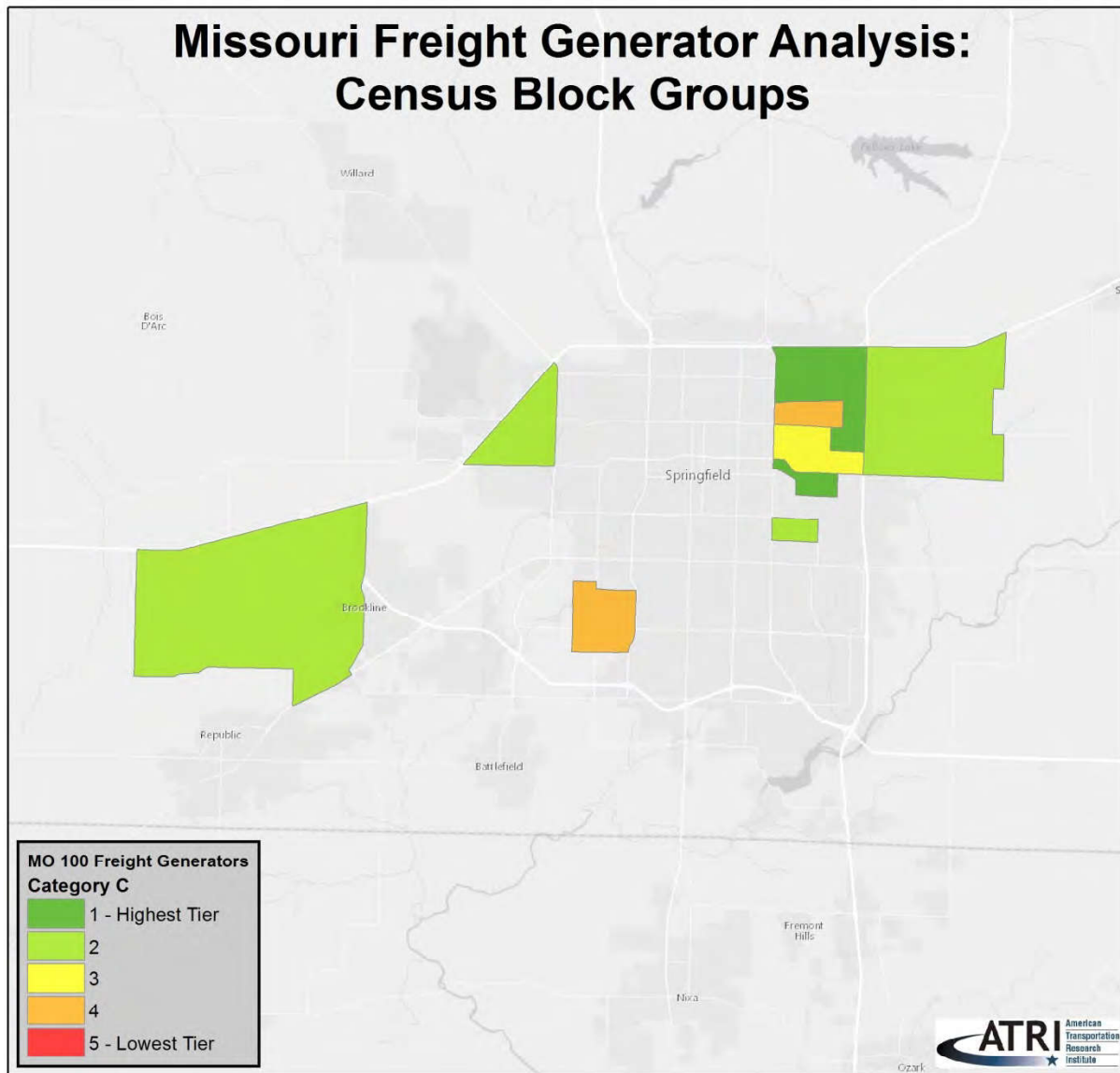
Appendix A: Attachments A-D

Figure 7: 100 Freight Generators - Category C, Joplin Detail



Appendix A: Attachments A-D

Figure 8: 100 Freight Generators - Category C, Springfield Detail



Appendix A: Attachments A-D

Conclusions

Truck GPS data provides insight into the location of key freight generators in Missouri. ATRI utilized its FPM database to count truck position pings and measure intensity of those pings resulting in a list of 100 key freight generators for the State. This analysis found that the majority of key freight generators were located along major roadways. Furthermore, urban areas such as St. Louis and Kansas City contained the highest share of generators, although several other freight-generating locations were identified throughout the State. This information can be used by MoDOT, in conjunction with an analysis on truck bottlenecks, to prioritize infrastructure investments that will improve mobility in the State. In particular, this information may be valuable for identifying the investment needs of critical last-mile connectors.

Appendix A

Attachment C: Missouri Congestion Analysis

Appendix A: Attachments A-D

Introduction

As part of the Missouri Department of Transportation's (MoDOT) State Freight Plan, the American Transportation Research Institute (ATRI) has been tasked with identifying the top 100 truck bottlenecks in Missouri. The following sections present the results of that analysis, which utilized truck GPS probe data from ATRI's Freight Performance Measures (FPM) database.

ATRI Freight Performance Measures (FPM) Database

As background, the ATRI FPM database compiles anonymous trucking operations data from several hundred thousand trucks using GPS data from onboard trucking systems - generating billions of data points annually. Each truck used in FPM analysis has a regular position read (generally every 1 to 15 minutes) and includes information on vehicle location, unique vehicle identification, time/date, and, in many cases, vehicle spot speed (which is obtained from the vehicle's engine).

Through these attributes, ATRI performs spatial queries and relates the FPM truck GPS data to a variety of transportation datasets using customized software and proprietary database management workflows. The ATRI FPM dataset supports studies throughout North America that seek to more fully understand the nature of trucking operations.

Methodology

ATRI conducted two primary analyses using FPM data: a truck travel speed analysis and a trucking intensity analysis. The study network was the National Highway System (NHS) as well as additional key routes utilized by the trucking industry (as identified by ATRI). The first step in these analyses was to isolate the applicable truck data from the ATRI FPM database and link it to the study network. ATRI utilized truck GPS data from four months in 2013 to account for seasonality: February, May, August, and November. To spatially link the data, ATRI developed a customized shapefile for the study network using ArcGIS software. The shapefile contained a polyline for each direction of travel for Interstate routes and each Interstate segment was generally one mile in length. Non-Interstate roads in the study network shapefile typically contained one polyline for both directions of travel and were segmented at the intersection with other NHS roadways. Additional segmentation was performed to ensure that no segment exceeded 20 miles in length. This resulted in a network totaling 3,311 segments, ranging in length from 0.24 miles to 19.9 miles (mean length 2.16 miles). Each segment was given a unique identifier and any truck point within 35 feet of Interstate segments and 100 feet of the non-Interstate segments was assigned the same unique identifier as the segment (note: the differing functional classes and shapefile properties of the two types of highways necessitated the two different buffers). The truck GPS data was then aggregated, generating an average speed and a count of position reads (i.e. sample size) for each hour of the day across all 3,311 segments.

Average hourly speeds were aggregated into four time periods to produce a statewide speed profile by time of day:

- Morning Peak (6:00 to 9:59 AM)
- Midday (10:00 AM to 2:59 PM)
- Evening Peak (3:00 PM to 6:59 PM)
- Off-peak (7:00 PM to 5:59 AM)

Next, ATRI quantified the congestion along the study highway network to identify the most severe trucking bottlenecks in the state. To generate this list, ATRI developed a congestion index based on average speeds and sample size (an indicator of truck volume). The first step was to identify the benchmark speed of each segment, for which ATRI used the off-peak average speed. This decision was based on the assumption that speeds will generally be highest in the off-peak hours due to lower traffic volumes. Next, ATRI compared the morning peak, midday, and evening peak average speeds with the benchmark speeds to identify times of the day when speeds were below the benchmark (i.e. experiencing travel time delay). ATRI then determined the sample size for each segment across the various time periods as an indicator of each segment's truck volume. Given that the segment lengths varied across the network, the sample size was divided by the segment length to generate a per-mile indicator of volume. Finally, the difference in travel time for each period was multiplied by the per-mile size of the sample for that period and the values for the three periods were added together to generate the total congestion index. The 100 segments with the highest congestion indices were isolated for further analysis as the top trucking bottlenecks in Missouri.

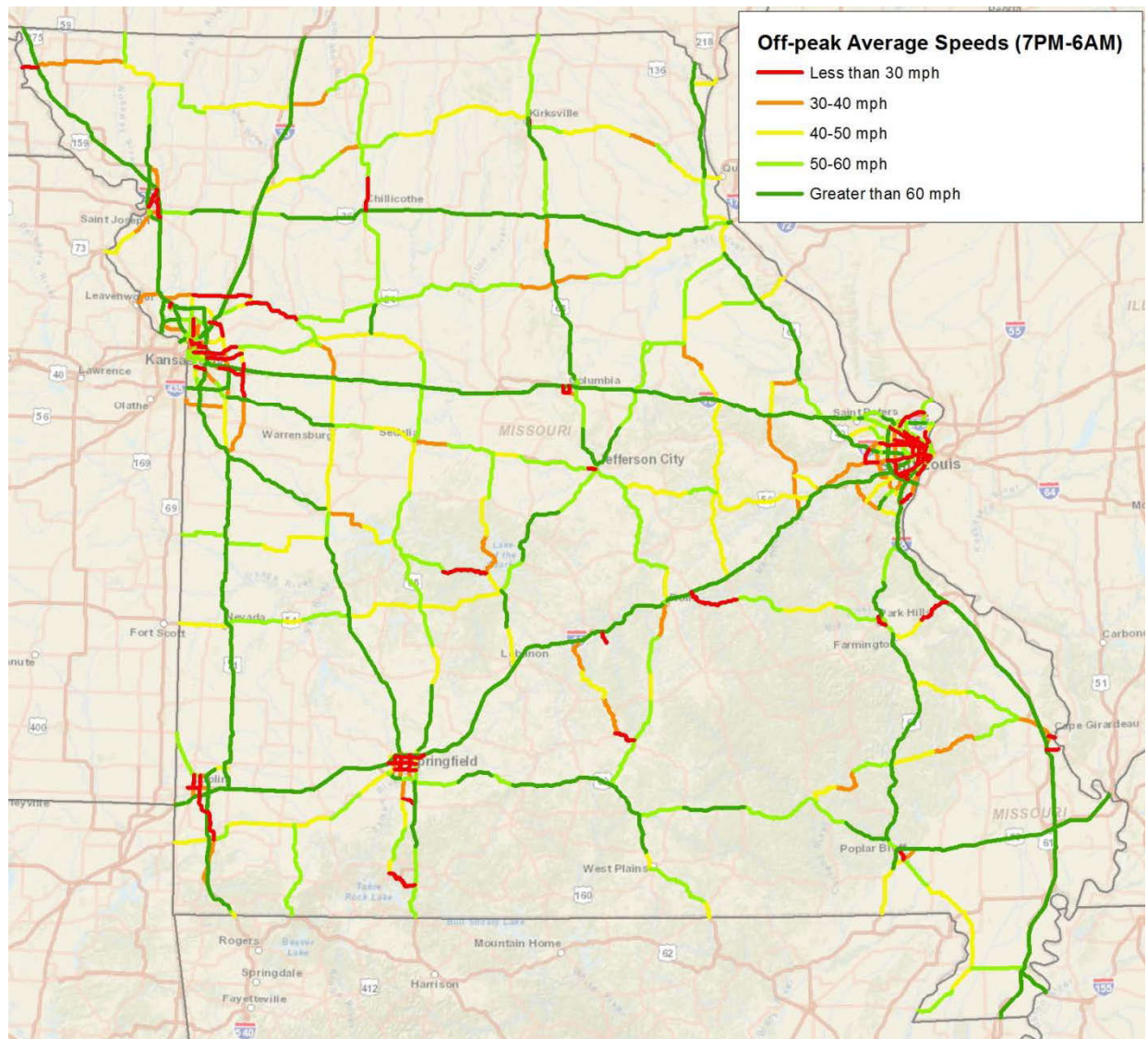
The following sections present the results of the statewide speed profile and the analysis of the top 100 truck bottleneck locations.

Appendix A: Attachments A-D

Statewide Speed Profile

As discussed in the methodology, the morning peak, midday, and evening peak average speeds were compared to off-peak average speed. Off-peak was chosen as the benchmark due to lower passenger vehicle activity at that time which is often the primary source of congestion. As a reference, **Figure 1** presents the average off-peak speeds for the network. Given that the network consists of roads of varying functional classes, low speeds during the off-peak period are likely indicative of the class of the road as opposed to indicating congestion. Across all segments, the average off-peak speed was 59.8 mph.

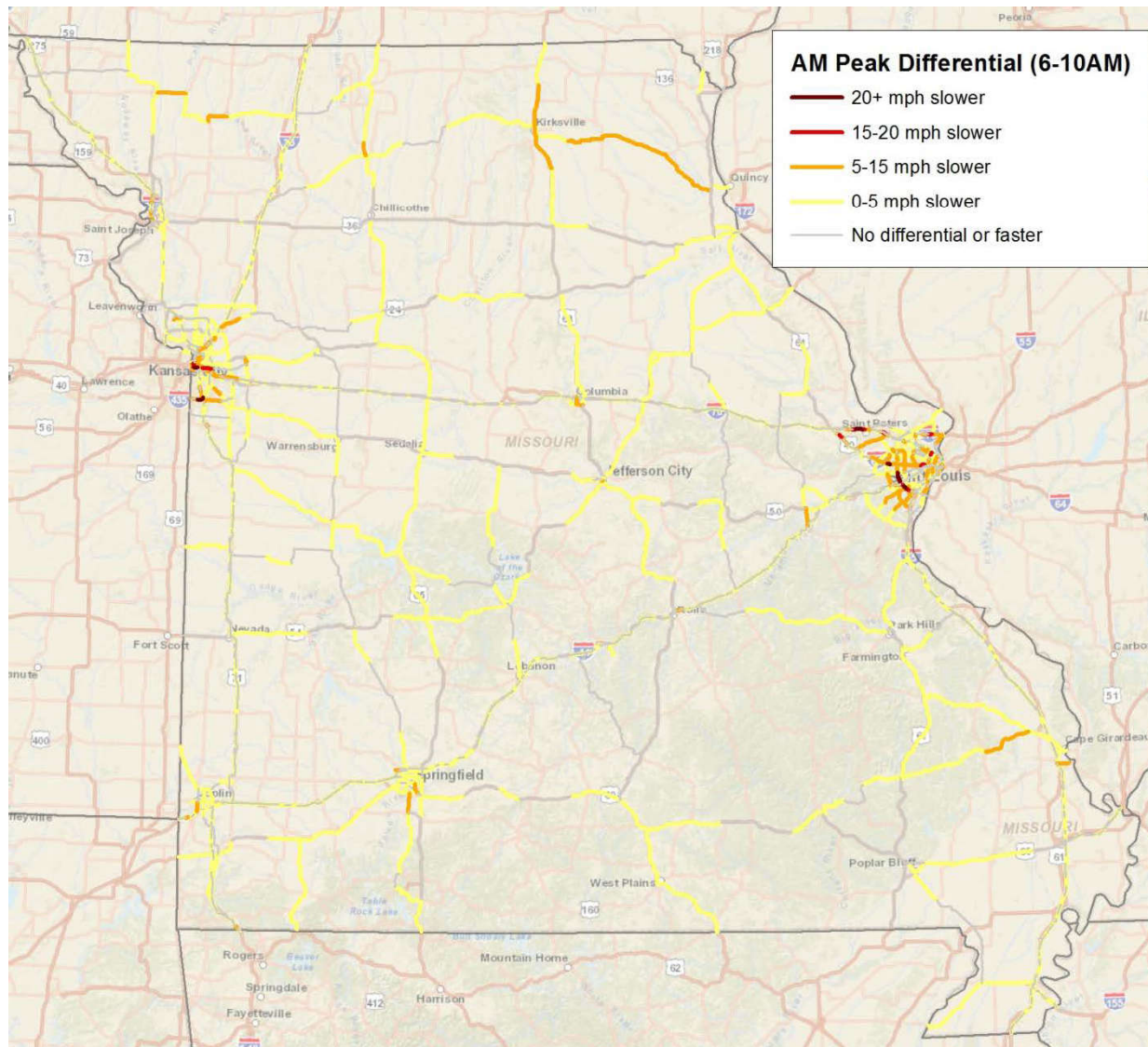
Figure 1: Off-peak Average Speeds



Appendix A: Attachments A-D

For each period, ATRI calculated the differential between that period's average speed and the off-peak benchmark. This allowed researchers to quickly identify locations that experienced large drops in speed during certain times of the day. **Figure 2** presents the morning peak average speeds as compared to the off-peak benchmark. As one would expect, the urbanized areas near St. Louis and Kansas City contained the highest concentration of severe congestion in the morning peak. However, trucking congestion in the morning peak does not appear to be a severe problem in most locations. Of the 3,311 segments in the network, only 22 segments (totaling 23.7 miles in length) experienced a speed differential of 15 mph or slower. The overall average speed across all segments was 59.0 miles per hour during the morning peak period, which was marginally slower than the off-peak average of 59.8 miles per hour.

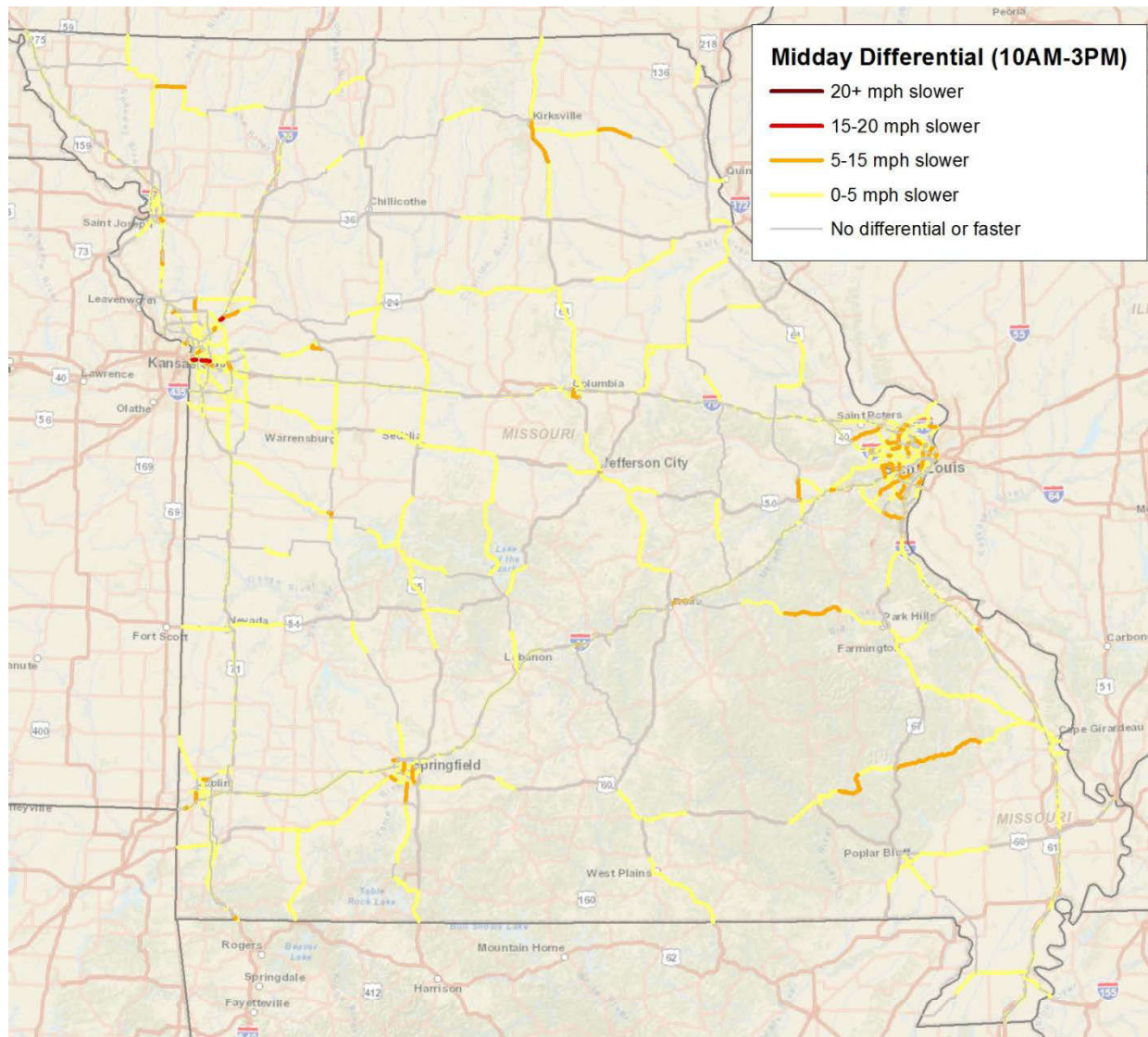
Figure 2: Morning Peak Average Speeds



Appendix A: Attachments A-D

The results of the midday average speed analysis are shown in **Figure 3**. Average speeds generally increased compared to the morning peak, reflecting the end of the morning rush hour. There were only three segments (totaling five miles in length) with a differential of 15 miles per hour or slower. Overall, speeds averaged 59.5 miles per hour across all segments in the midday period.

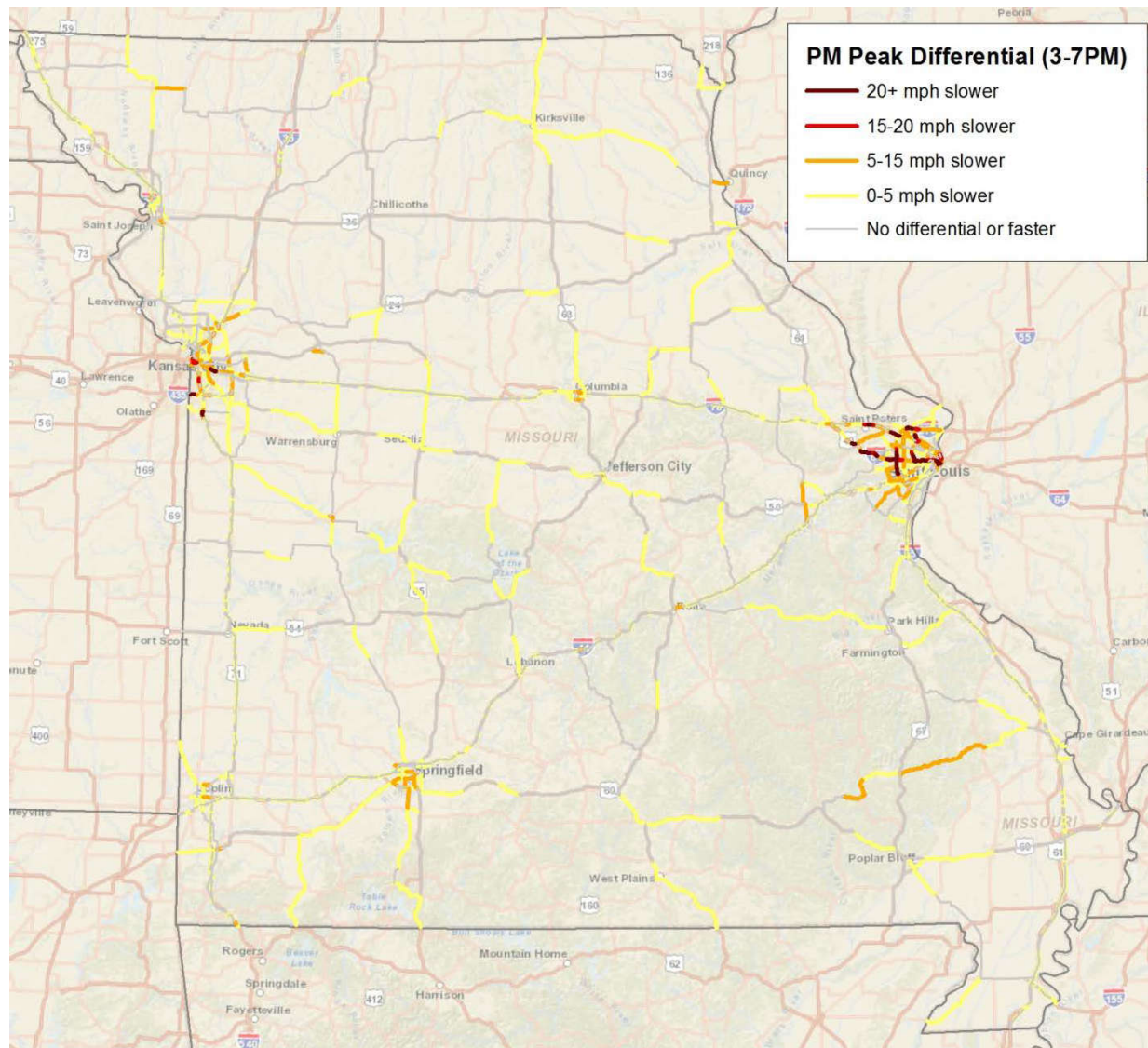
Figure 3: Midday Average Speeds



Appendix A: Attachments A-D

Next, ATRI analyzed the evening peak average speeds, as shown in **Figure 4**. Speeds tended to be lowest in this period, with the overall average speed dropping to 58.8 miles per hour across all segments. Furthermore, the evening peak contained the greatest number of segments with a differential of 15 miles per hour or slower (54 segments totaling 53.5 miles of roadway). Differentials were greatest in the St. Louis and Kansas City areas, although a cluster of differentials in the 5-15 mile per hour range was identified in the Springfield area.

Figure 4: Evening Peak Average Speeds

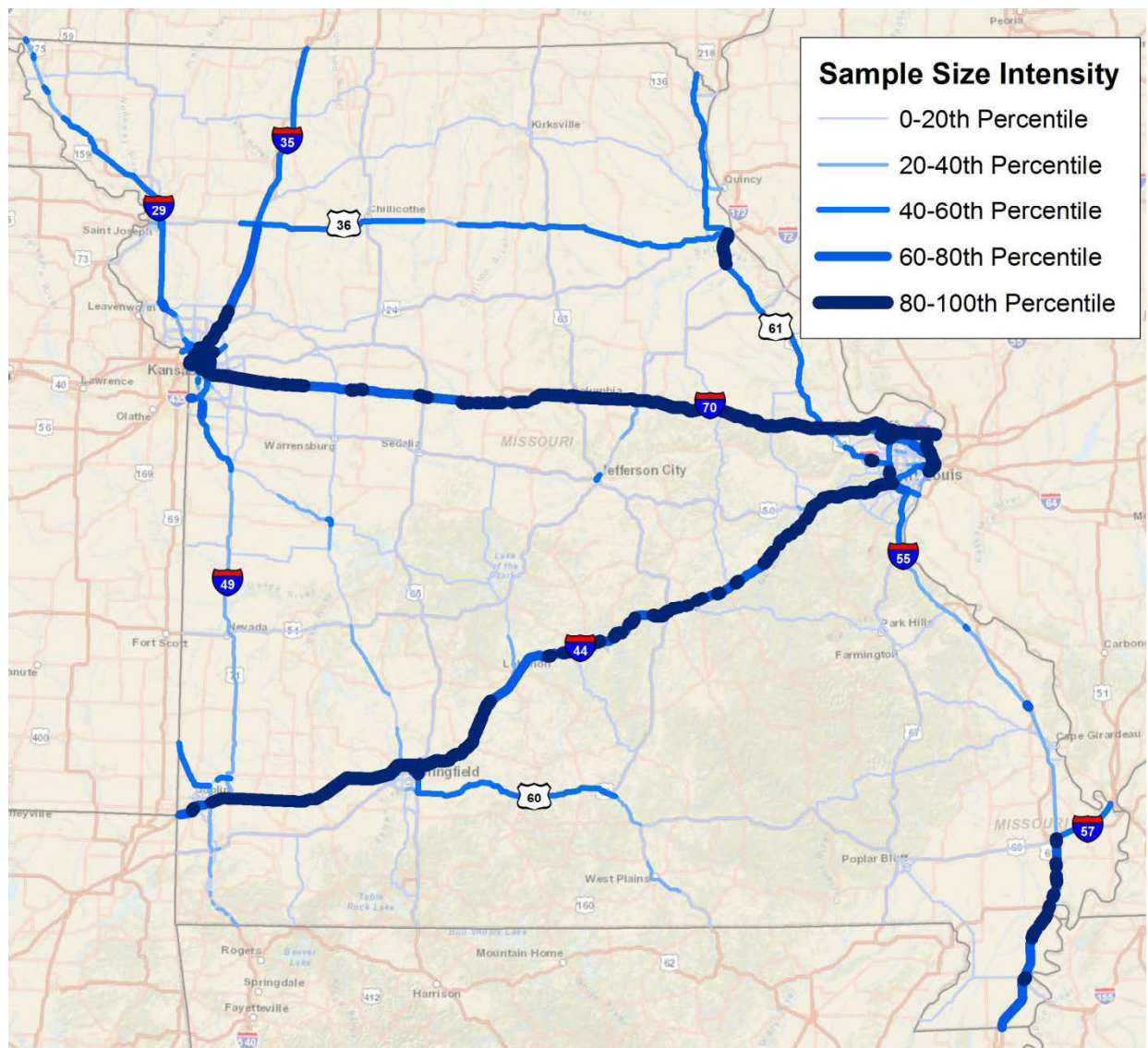


Appendix A: Attachments A-D

Bottleneck Analysis

The average speed by time of day was the primary input of ATRI's bottleneck analysis. However, it was also necessary to utilize an indicator of volume in the bottleneck analysis to ensure that roads with moderate to heavy truck volume were more heavily weighted in the bottleneck analysis than roads with little to no truck traffic. **Figure 5** depicts ATRI's sample size variation across Missouri using percentile rankings. For example, a road with a percentile score of 90 indicates that 90 percent of roads had a smaller sample size, suggesting that particular road segment was heavily used by trucks. Interstate highways and key arterials typically generated the largest percentile scores.

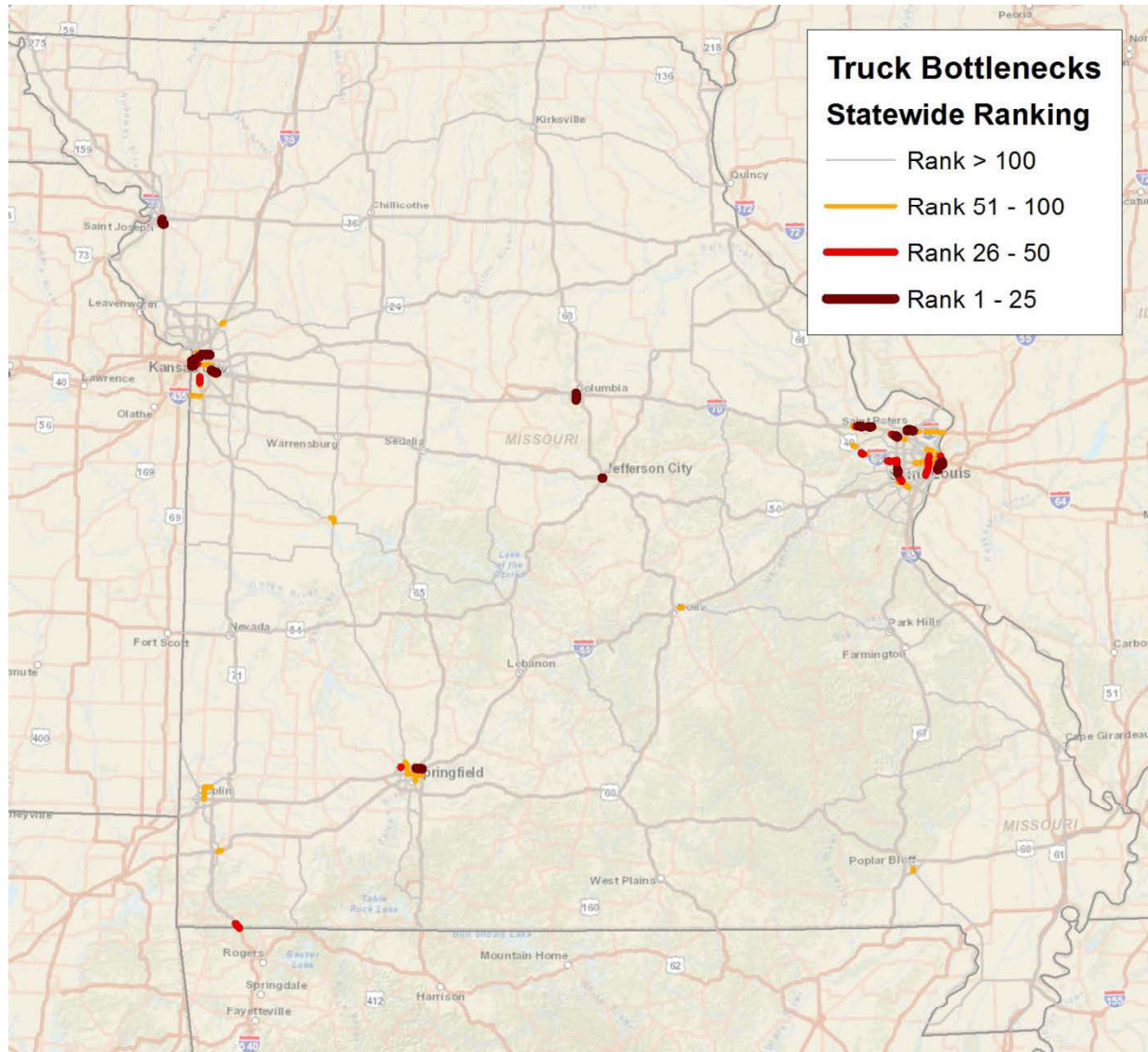
Figure 5: Sample Size Intensity

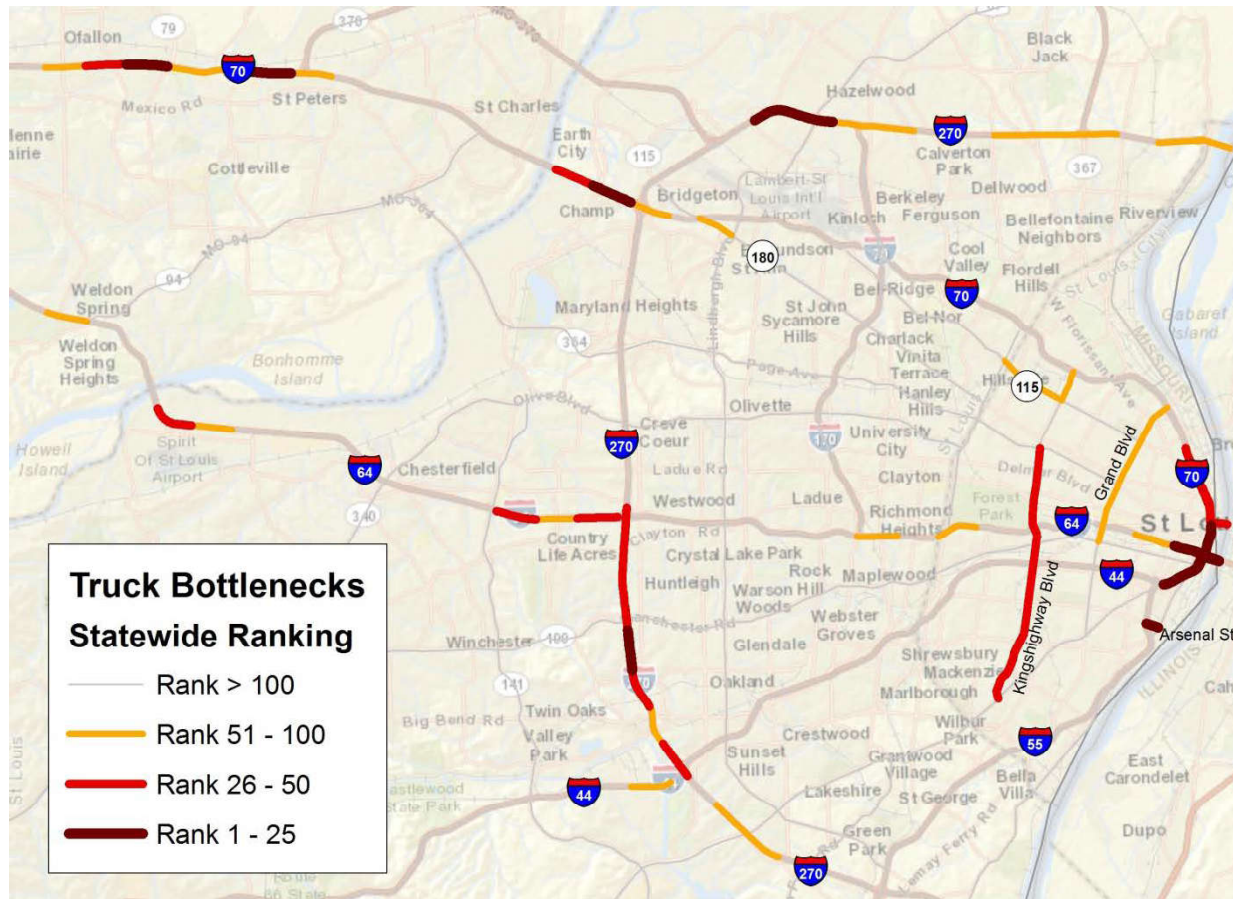


Appendix A: Attachments A-D

With average speeds and sample size intensities calculated, ATRI generated a congestion index for each network segment. The 100 segments with the highest congestion index were isolated for additional analysis as the most severe truck bottlenecks in Missouri. **Figure 6** presents the 100 segments identified as bottlenecks through this analysis. St. Louis and Kansas City contained 81 out of the State's 100 bottlenecks; however, Springfield also contained several bottlenecks, as did other cities and towns across the State.

Figure 6: Top 100 Truck Bottlenecks in Missouri

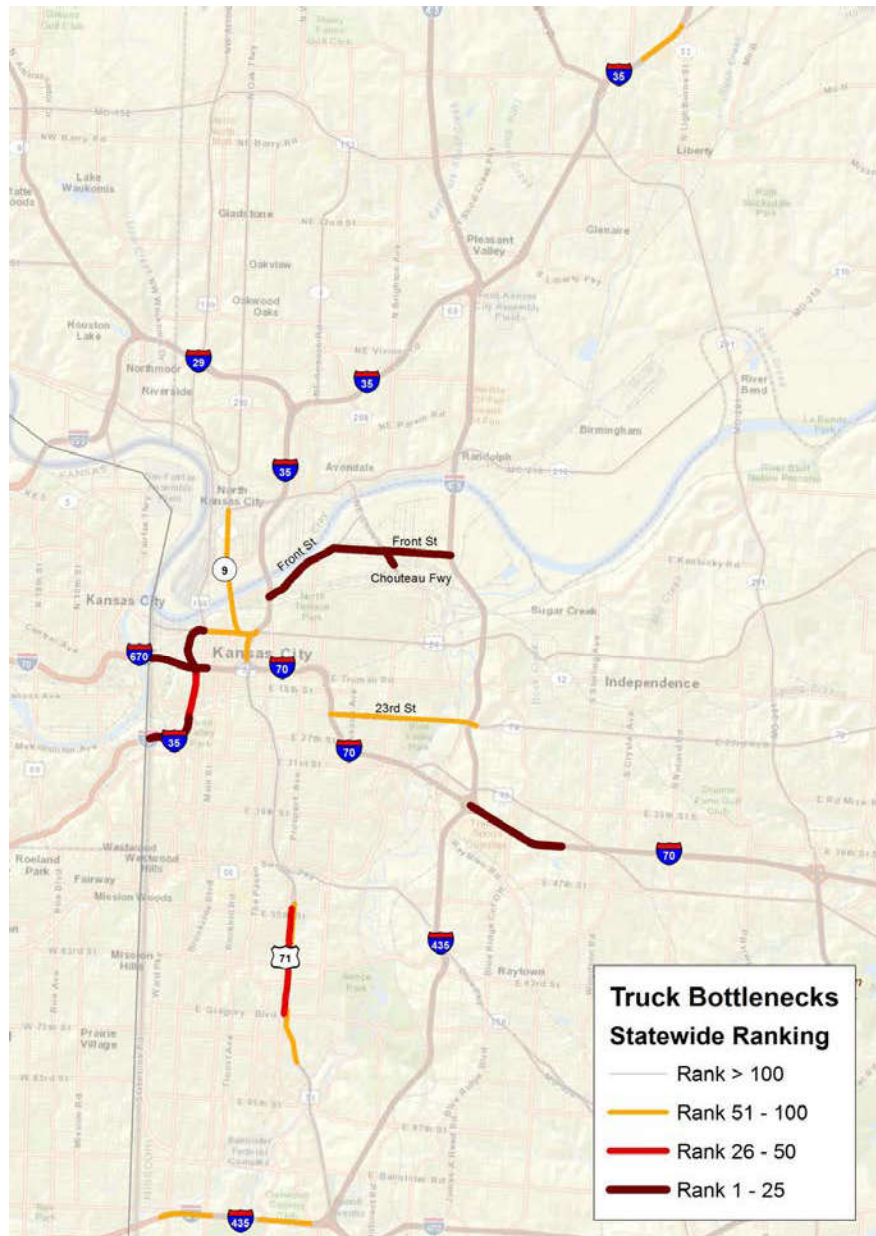




Appendix A: Attachments A-D

Figure 8 highlights the 22 bottlenecks identified in the Kansas City area. The analysis revealed two primary bottleneck clusters and several other isolated bottlenecks. The complex intersection with I-70, I-670, I-35, and MO-9 generated a truck bottleneck along all of those routes near downtown Kansas City. Additionally, Front Street and the Chouteau Freeway, which are located near a major rail facility, were among the worst bottlenecks in the state. Beyond those two bottleneck clusters, other problem areas include I-70 east of I-435, I-435 west of I-470, I-35 north of MO-291, US 71 between 75th Street and 55th Street, and 23rd Street between I-70 and I-435.

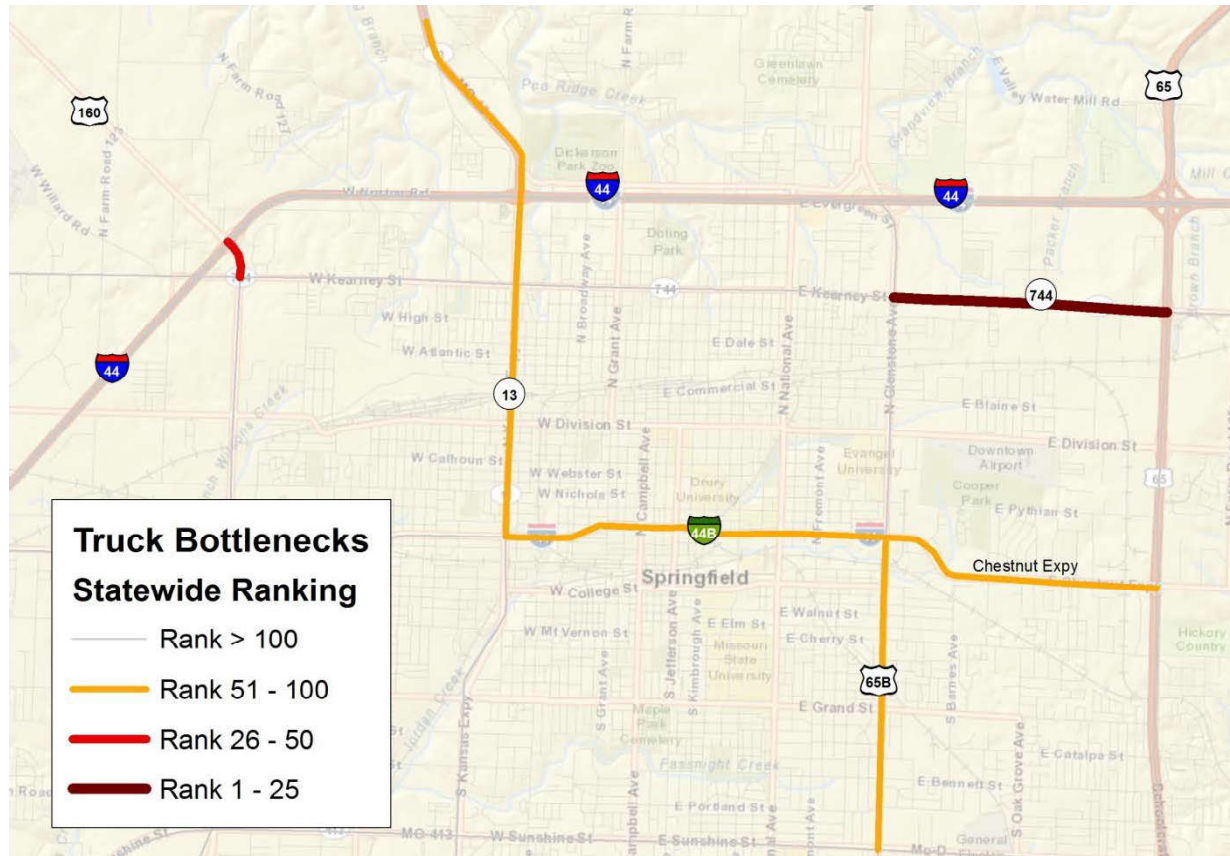
Figure 8: Bottlenecks in the Kansas City area



Appendix A: Attachments A-D

Figure 9 illustrates the seven bottlenecks identified in the Springfield area. The most severe bottleneck in the area was located on MO-744 (E. Kearney Street) between US-65 and N. Glenstone Avenue. A small portion of US-160 south of I-44 also ranked highly on ATRI's analysis. Other bottlenecks include portions of MO-13, the Chestnut Expressway from MO-13 to US-65 (partially signed I-44 Business), and US-65 Business from the Chestnut Expressway to East Sunshine Street.

Figure 9: Bottlenecks in the Springfield area

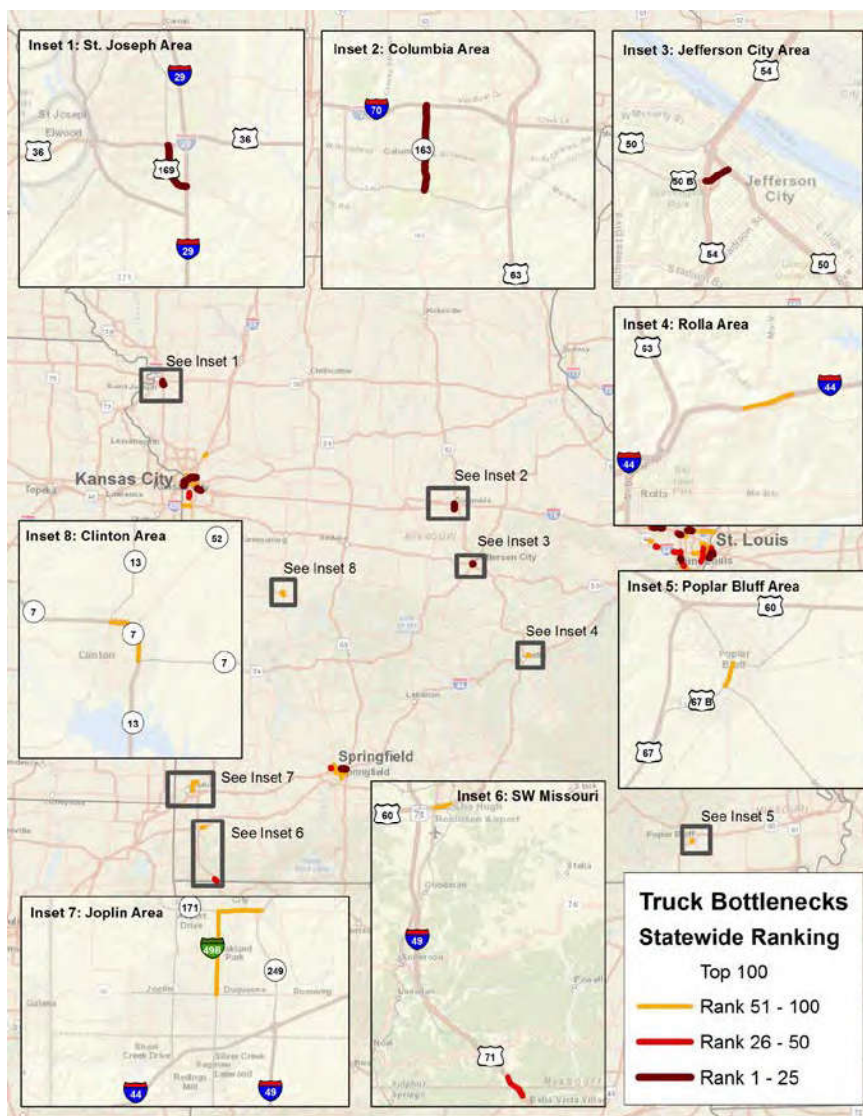


Appendix A: Attachments A-D

Beyond the urban areas of St. Louis, Kansas City, and Springfield, several other truck bottlenecks were identified throughout Missouri. **Figure 10** presents the remaining 12 bottlenecks in the state, which includes:

- US-169 between I-29 and US-36 near St. Joseph (Inset 1)
- MO-163 south of I-70 in Columbia (Inset 2)
- US-60 Business between US-54 and US-50 in Jefferson City (Inset 3)
- I-44 east of Rolla (Inset 4)
- US-67 Business in Poplar Bluff (Inset 5)
- US-60 east of I-49 near Neosho (Inset 6)
- Several segments of US-71 near the Arkansas border (Inset 6)
- Portions of I-49 Business and MO-171 near Joplin (Inset 7)
- MO-7 near MO-13 and MO-52 in Clinton (Inset 8)

Figure 10: Other Truck Bottleneck Locations in Missouri



Appendix A: Attachments A-D

Conclusions

As demonstrated through this analysis, truck GPS data provides valuable information on the location and relative severity of truck bottlenecks. ATRI utilized its FPM database to calculate average speeds by time of day along 3,311 road segments in Missouri and generated a list of the 100 segments with the highest level of truck congestion. While the majority of the congestion was located in the St. Louis and Kansas City areas, several other bottleneck locations were identified throughout the state. This information can be used by MoDOT to prioritize infrastructure investments that will have the greatest impact on freight mobility in the State.

Appendix A

Attachment D: MoDOT Freight Analysis

Appendix A: Attachments A-D

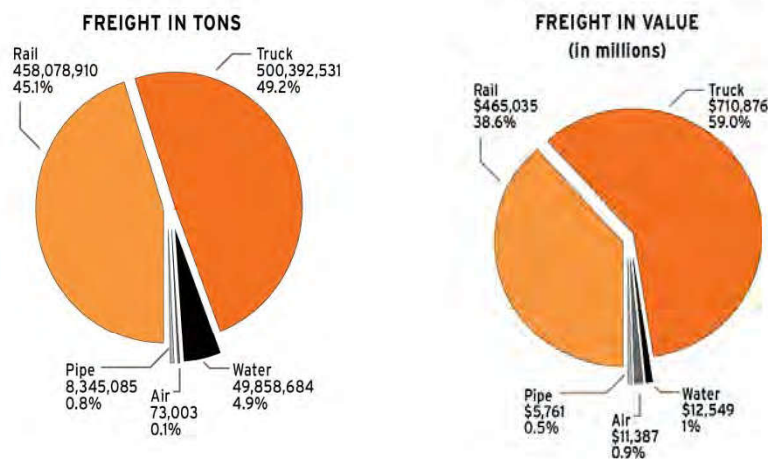
Different analysis perspectives help identify the most important freight movements to Missouri. TRANSEARCH[®] data provides Missouri-related movements by mode, direction, and commodity, and by tonnage, units, and value. Sorting the extensive TRANSEARCH[®] database generates different perspectives and observations. For example, it provides sufficiently detailed information to allow us to consider the following question: are the most important movements assessed by volume (tons), units (trucks or railcars), shipment value, commodity type, transport mode, directional movement, or some other factor (e.g., economic relevancy), or combination? In addition, the data multidimensionality precludes a simplified synopsis of all relevant freight dimensions simultaneously, and instead necessitates selected partial depictions of the most salient dimensional combinations.

While the ensuing report details various components in stepwise progression, this summary provides a broad overview, addressing how different conclusions are drawn from different perspectives. Moreover, the freight analysis is crafted to facilitate a subsequently conducted economic impact analysis of freight movements, which focuses on how industries in Missouri rely on inbound and outbound freight to produce goods and/or sell goods and services.

Movement Totals

Over 1.0 billion tons of freight traversed the Missouri transportation infrastructure network in 2011, valued at over \$1.2 trillion (in 2011 dollar values)¹. Statewide, the modal composition for tonnage and value are relatively similar (see **Figure 1**); however, proportions differ between tonnage and value, given the differing modal-specific values per ton. Clearly, truck carries the most tonnage and value, followed by rail and port, respectively.

Figure 1: Total Tons and Value by Mode, 2011



Source: prepared by CDM Smith, based on TRANSEARCH[®] data for 2011

- Truck - largest: 500.4 million tons (49.2% of total) and \$710.9 billion (59.0% of total).
- Rail - second largest: 458.1 million tons (45.1%) and \$465.0 billion (38.6%).
- Port - comparatively minor: 49.9 million tons (4.9%), valued at \$12.5 billion (1.0%).
- Pipeline and Air - movements are comparatively small in terms of both tons and value.

Disaggregation of the modal movements by direction reveals nuances. Through tonnage dominates directional movements, due primarily to both rail and trucking. Tonnage and value data are tabulated by mode and direction in **Table 1**, and summarized below:

¹ In comparison, the United States' Gross Domestic Product (GDP) in 2011 amounted to \$15.5 trillion (Bureau of Economic Analysis); Missouri's \$1.2 trillion in freight represents about 7.8%.

Appendix A: Attachments A-D

- **Outbound** – Of the 116.8 million tons from Missouri to out-of-state destinations, trucking dominates (75.3 million, 64.5%), followed by rail (21.5 million, 18.4%) and ports (20.0 million, 17.1%). Outbound tonnage is valued at \$146.5 billion.
- **Inbound** – 187.6 million tons from out-of-state destined to Missouri are predominantly split between rail (92.3 million, 49.2%) and truck (89.3 million, 47.6%). Inbound tonnage is valued at \$166.8 billion.
- **Intrastate** – At 113.0 million tons and valued at \$64.2 billion, intrastate tonnage movements are the smallest proportion of directional movements (11.1%), which are comprised mostly of truck movements (105.6 million tons, 93.5%).
- **Through** – A total of 599.3 million tons of through movements, mostly via rail (341.8 million, 57.0%) and truck (230.2 million, 38.4%) comprise the largest tonnage share of the directional movements (58.9%), highlighting Missouri's role as "bridge" state.

Table 1: Tons and Value by Mode and Direction, 2011

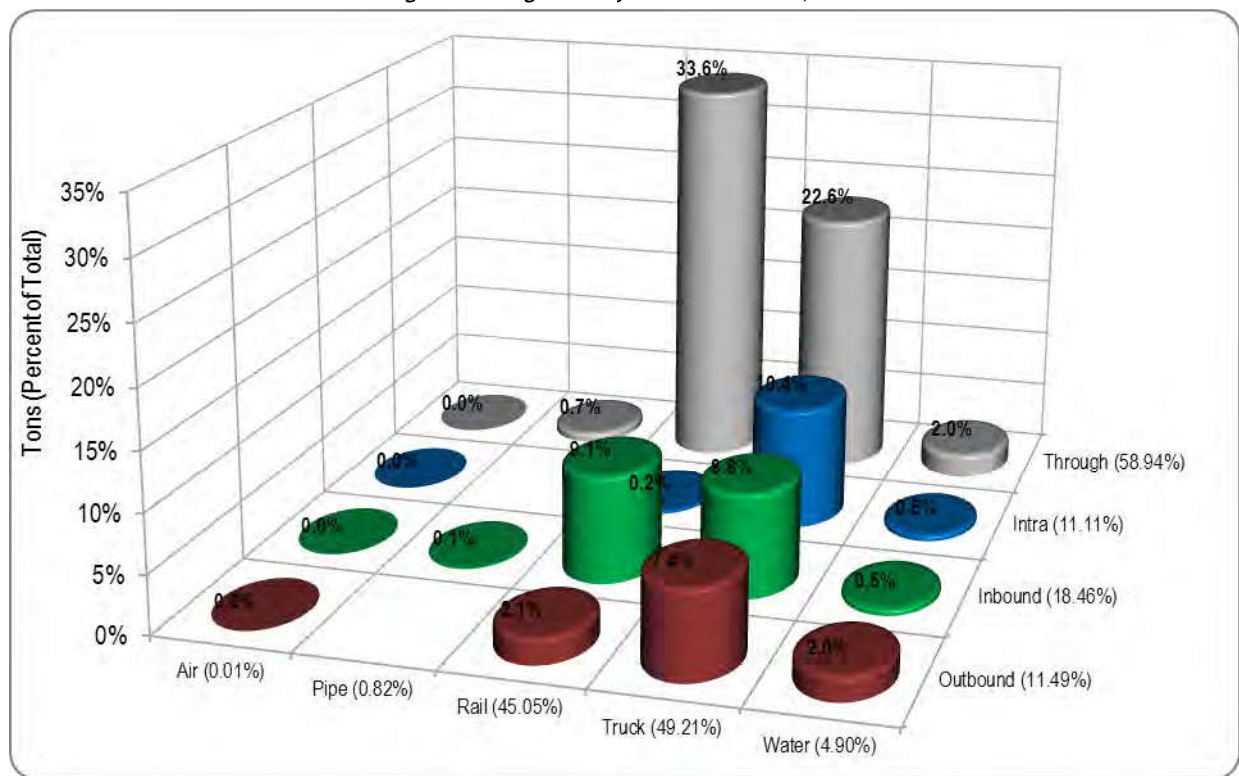
Direction	Air	Pipe	Rail	Truck	Water	Total
Tons						
Outbound	34,313	#N/A	21,510,433	75,301,621	19,973,291	116,819,658
Inbound	38,249	932,258	92,326,793	89,250,507	5,093,847	187,641,654
Intra	370	#N/A	2,436,087	105,627,915	4,941,503	113,005,875
Through	71	7,412,827	341,805,597	230,212,488	19,850,043	599,281,026
Total	73,003	8,345,085	458,078,910	500,392,531	49,858,684	1,016,748,213
Value, in millions						
Outbound	\$7,620	#N/A	\$40,364	\$95,005	\$3,479	\$146,468
Inbound	\$3,656	\$643	\$39,647	\$119,731	\$3,083	\$166,760
Intra	\$100	#N/A	\$1,616	\$62,346	\$117	\$64,179
Through	\$10	\$5,117	\$383,409	\$433,794	\$5,870	\$828,200
Total	\$11,387	\$5,761	\$465,035	\$710,876	\$12,549	\$1,205,607

Source: prepared by CDM Smith, based on TRANSEARCH® data for 2011

Relative modal and directional shares of total tonnage movements are depicted in **Figure 2**, and by total value in **Figure 3**, which clearly indicate that through-based rail and truck movements comprise the majority of freight in Missouri (combined, 56.3% of total tonnage and 67.8% of total value), reinforcing the perspective of a Missouri serving as a bridge state.

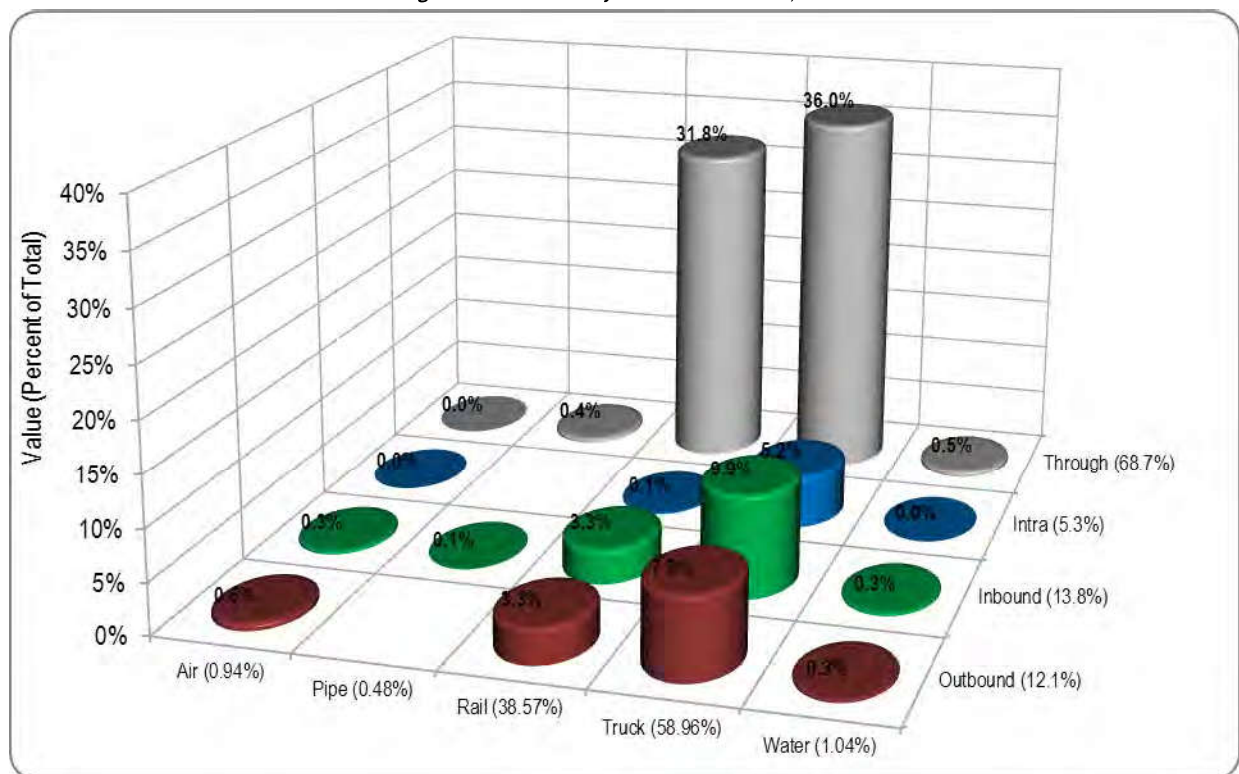
Appendix A: Attachments A-D

Figure 2: Tonnage Share by Mode and Direction, 2011



Source: prepared by CDM Smith, based on TRANSEARCH® data for 2011

Figure 3: Value Share by Mode and Direction, 2011



Source: prepared by CDM Smith, based on TRANSEARCH® data for 2011

Appendix A: Attachments A-D

Perspective

Directional movement, commodity tonnage, and commodity value help illustrate the importance of freight movements to Missouri from different perspectives. Such perspectives assist in estimating the economic impacts of freight movement.

Directional Movement – Directional freight movements impact Missouri differently. Inbound commodities from out-of-state comprise two basic types: final goods and intermediate production materials (inputs). Final goods typically go directly to consumers or to retail outlets; hence, associated economic impacts are, at most, a function of markup margins. Comparatively, economic impacts associated with inbound materials used in Missouri manufacturing or other value-added processes can be quite significant. Similarly, outbound commodities from Missouri to other states also represent the result of value-added Missouri production. Additionally, intrastate Missouri movements represent both value-added Missouri production and/or product markup. However, freight movements through Missouri generate little, if any, economic value to the State (i.e., transport service only). Nonetheless, the magnitude of through-state truck and rail volumes is important in a freight plan given the effect on modal infrastructure capacity.

Commodity Tonnage and Value – While important to understand tonnage movements, such observations do not unilaterally address the importance of freight movements to Missouri (other considerations matter such as value, direction, mode, etc.). Top commodity tonnages (via all modes and directions, combined) are led by Coal (237.6 million, 23.4%), followed by Farm Products (129.2 million, 12.7%), and Nonmetallic Minerals (123.7 million, 12.2%); see Table 2. Comparatively, the top commodity value movements (via all modes and directions, combined) are led by Miscellaneous Mixed Shipments (\$189.3 billion, 15.7%), followed by Transportation Equipment (\$163.7 billion, 13.6%), and Secondary Traffic (\$161.7 billion, 13.4%); see Table 3.

Table 2: Top Commodities by Tonnage, 2011

STCC ²	Commodity	Tons (in thousands)	
		Amount	Percent
11	Coal	237,585	23.4%
01	Farm Products	129,200	12.7%
14	Nonmetallic Minerals	123,662	12.2%
20	Food or Kindred Products	98,474	9.7%
28	Chemicals or Allied Products	84,647	8.3%
50	Secondary Traffic	83,952	8.3%
29	Petroleum or Coal Products	47,132	4.6%
46	Misc Mixed Shipments	37,592	3.7%
32	Clay, Concrete, Glass or Stone	31,538	3.1%
37	Transportation Equipment	19,410	1.9%
	Remaining Commodities	123,557	12.2%
	Total	1,016,748	100.0%

Source: prepared by CDM Smith, based on TRANSEARCH[®] data for 2011

² STCC – Standard Transportation Commodity Code

Appendix A: Attachments A-D

Table 3: Top Commodities by Value, 2011

STCC2	Commodity	Value (in millions)	
		Amount	Percent
46	Misc Mixed Shipments	\$189,344	15.7%
37	Transportation Equipment	\$163,658	13.6%
50	Secondary Traffic	\$161,694	13.4%
28	Chemicals or Allied Products	\$134,438	11.2%
20	Food or Kindred Products	\$99,907	8.3%
01	Farm Products	\$57,608	4.8%
35	Machinery	\$57,147	4.7%
36	Electrical Equipment	\$54,732	4.5%
33	Primary Metal Products	\$50,411	4.2%
29	Petroleum or Coal Products	\$42,095	3.5%
	Remaining Commodities	\$194,573	16.1%
	Total	\$1,205,607	100.0%

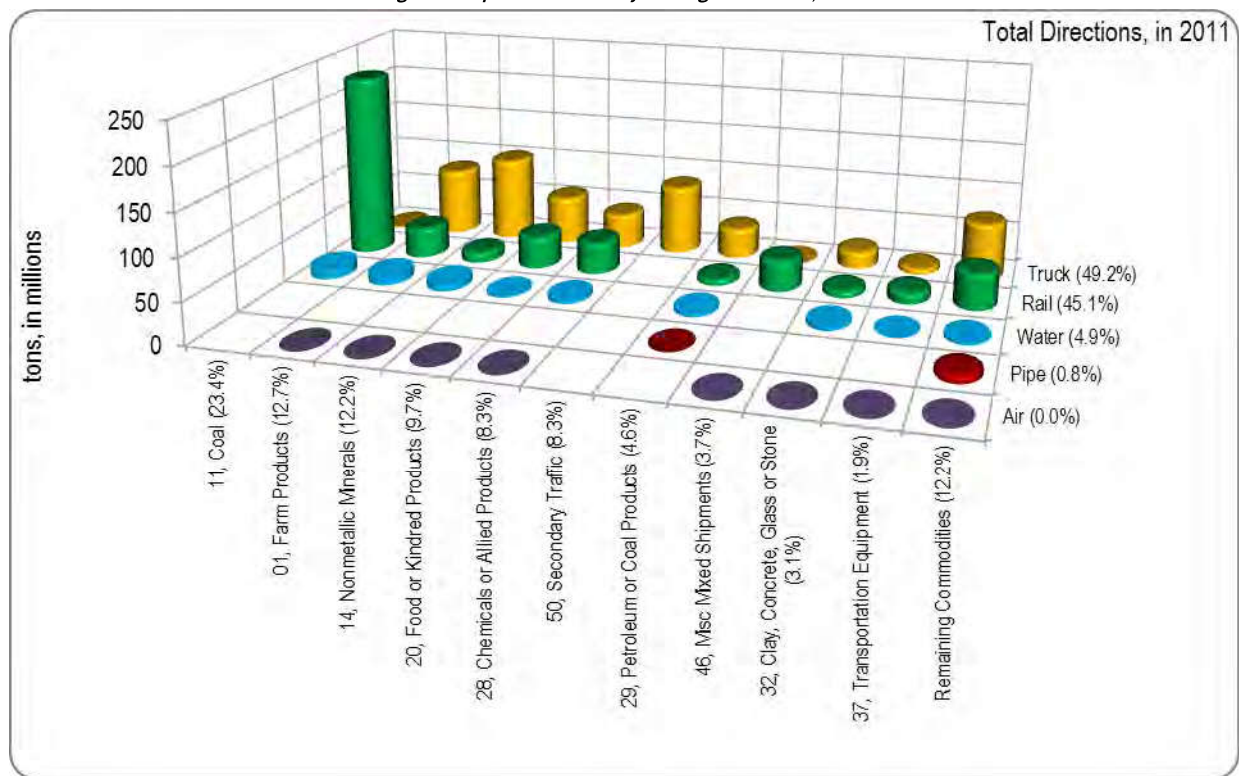
Source: prepared by CDM Smith, based on TRANSEARCH® data for 2011

Commodity Tons by Mode - Figure 4 illustrates modal differences by commodity tonnage. Truck leads most commodity ton movements, especially Farm Products, Nonmetallic Minerals, and Secondary Traffic, as well as other Remaining Commodities; however, rail-based Coal is, by far, the largest single commodity movement. Port, air, and pipeline commodity ton movements are all dwarfed by truck and rail.

Commodity Value by Mode - Figure 5 shows modal differences by commodity value, as compared to the ton volumes. A similar pattern is observed, with truck-based commodity movement generally exceeding all other modes, especially, Food and Kindred Products, Farm Products, Secondary Traffic, and other Remaining Commodities. However, rail-based Miscellaneous Mixed Shipments are the largest movement by value, and rail-based Transportation Equipment movement value exceeds truck. Similarly to tonnage movements, the port, air, and pipeline value movements are all insignificant compared to either truck or rail.

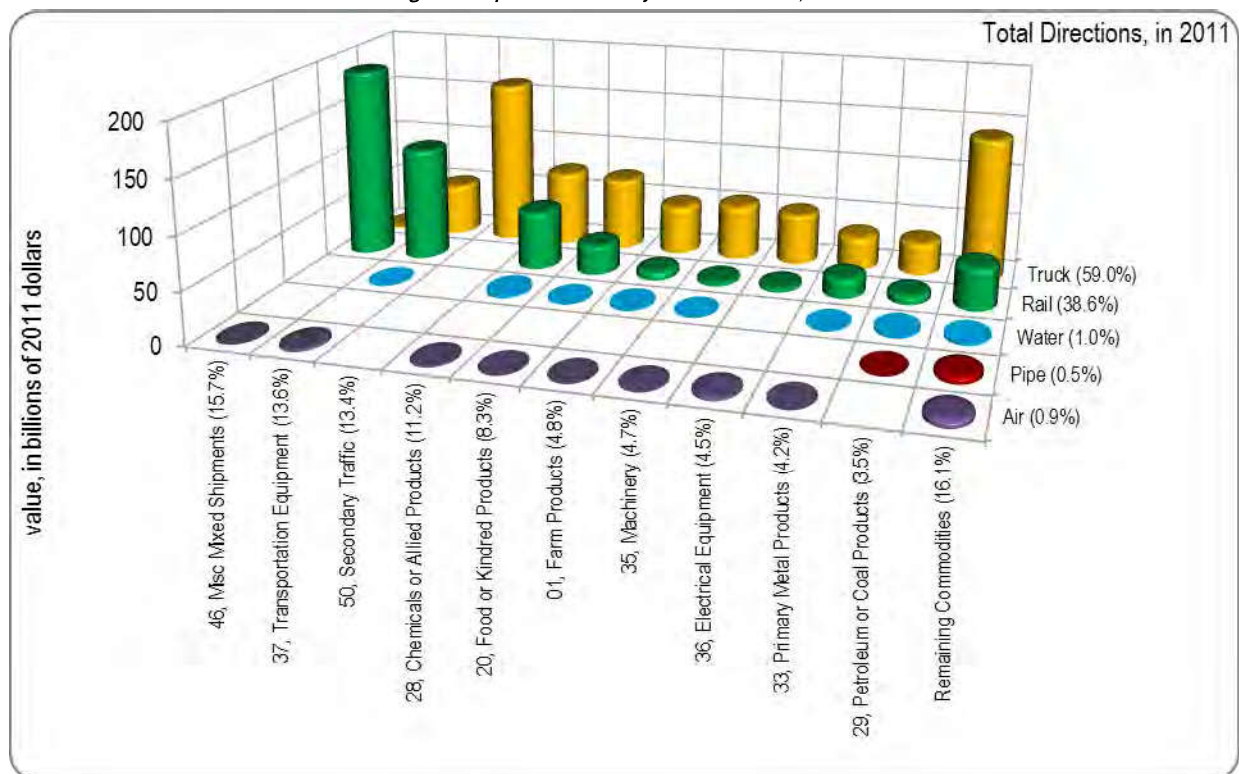
Appendix A: Attachments A-D

Figure 4: Top Commodities by Tonnage and Mode, 2011



Source: prepared by CDM Smith, based on TRANSEARCH® data for 2011

Figure 5: Top Commodities by Value and Mode, 2011



Source: prepared by CDM Smith, based on TRANSEARCH® data for 2011

Appendix A: Attachments A-D

A vast amount of freight traverses Missouri's infrastructure annually. Such freight includes finished goods, materials, and supplies. Central issues concerning freight are: identifying the movements most important to Missouri, and identifying options to facilitate/support them. Identifying the importance of, and solutions for, freight comprises several perspectives: volumes (especially compared to capacity), values, related economic impacts, and public perception.

Freight volumes and value, as reported in the TRANSEARCH[®] database, are summarized, tabulated to facilitate simplified comprehension and for a subsequent freight-related economic impact analysis. Structurally, the report is organized as follows:

- Overview of the commodity reporting conventions and primary data source
- Summary of year 2011 volumes, units, and value by mode (truck, rail, port/water, air, and pipeline) and direction (outbound, inbound, intrastate, and through)
- Summary of year 2040 forecast movements and growth rates
- Conclusion and discussion of next steps for economic impact estimation

Standard Transportation Commodity Code (STCC) – A STCC is a seven digit numeric code, categorized by 40 commodity groupings, based on a publication specifying physical product information used on waybills and other shipping documents and published/maintained by the American Association of Railroads (AAR). A STCC for any physical product is associated with a commodity description conforming to exact descriptions in freight transportation classifications of rail and motor carriers. North American Freight Railroads, the Railroad Waybill, the Commodity Flow Survey (CFS), and TRANSEARCH[®] adopt the STCC coding system. A hierarchical STCC structure allows data collapsibility, enabling summarization of commodity information at various levels (i.e., '01' represents 'Farm Products', '011' identifies 'Field Crops', '0112' indicates 'Raw Cotton', etc., narrowing in specificity to a seven-digit level). Although freight movements are tallied at the four-digit STCC detail in TRANSEARCH[®], the information reported herein is aggregated at the two-digit level for ease of summary.

TRANSEARCH[®] – Developed by IHS Global Insight, TRANSEARCH[®] is a comprehensive database of North American freight flows, compiled from more than a hundred industry, commodity, and proprietary data exchange sources. TRANSEARCH[®] combines primary shipment data obtained from some of the nation's largest rail and truck freight carriers with information from public, commercial, and proprietary sources to generate a base year estimate of freight flows at the county level. Further, TRANSEARCH[®] establishes market-specific production volumes by industry or commodity, drawn mostly from IHS Global Insight's Business Markets Insights (BMI) database, and supplemented by trade association and industry reports, and United States government-collected data – especially from the Input/Output (I/O) tables produced by the Bureau of Economic Analysis (BEA).

Current Freight

The following discussion presents year 2011 freight movements by mode (truck, rail, port/water, air, and pipeline), direction (outbound, inbound, intrastate, and through), and terms (tons, units³, and values), as applicable and available, and generally in that sequencing. Each subsection summarizes modal movements by direction and term, and identifies the top two-digit STCC commodity movements. Data is mostly presented graphically for ease of visually identifying important commodity movements and related observations, with the supporting tabulated comprehensive data located in the Appendix, in **Table 15** through **Table 34**. Structurally, the report is compiled such that the respective section may be read independently with simplified and synopsisized data components identified without dependence on preceding or subsequent subsections.

Truck, 2011

Missouri truck movements in 2011 totaled 500.4 million tons, valued at \$710.9 billion, and carried within 40.6 million units (**Table 4**). On average, total truck commodity movements are valued at \$1,421/ton. Truck movements represent 49.2% or modal tonnage in Missouri and 59.0% of total modal value in 2011, the largest relative share.

As depicted in **Figure 6**, through truck movements are the largest directional movements: 46.0% of total tonnage, 36.4% of units, and 61.0% of value; the higher proportion of value relative to tonnage reflects the higher average value/ton for through-based truck movements as compared with the other truck directions. Outbound, inbound, and intrastate movements comprise a remaining 270.2 million tons (54.0%), valued at \$277.1 billion (39.0%).

³ units are available and presented only for truck and rail modes

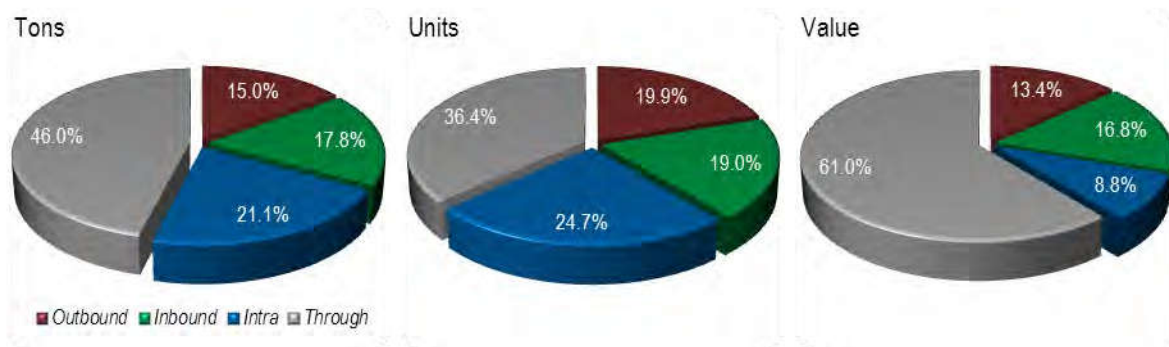
Appendix A: Attachments A-D

Table 4: Truck by Direction, 2011

Direction	Tons		Units		Value (in millions)		Average Value/Ton
	Amount	Percent	Amount	Percent	Amount	Percent	
Outbound	75,301,621	15.0%	8,088,079	19.9%	\$95,005	13.4%	\$1,262
Inbound	89,250,507	17.8%	7,725,094	19.0%	\$119,731	16.8%	\$1,342
Intra	105,627,915	21.1%	10,029,099	24.7%	\$62,346	8.8%	\$590
Through	230,212,488	46.0%	14,805,680	36.4%	\$433,794	61.0%	\$1,884
Total	500,392,531	100.0%	40,647,951	100.0%	\$710,876	100.0%	\$1,421

Source: prepared by CDM Smith, based on TRANSEARCH® data for 2011

Figure 6: Truck Percentages by Direction, 2011



Source: prepared by CDM Smith, based on TRANSEARCH® data for 2011

As expected, the major truck freight corridors include the major interstates (I-44, I-55, I-70, I-35, and I-29), as seen in **Figure 7**. Additionally, major US and State highways in the urban centers also accommodate significant freight movements (e.g., US-61 and US-71).

Figure 8, Figure 9, and Figure 10 depict the top two-digit STCC commodities for Missouri truck, by tonnage, units, and value, respectively, with a directional composition⁴. Such graphics depict the largest respective commodity movements for truck by direction, and in conjunction with the tabulated data in **Table 15** through **Table 18**, in the Appendix, the top truck commodity movements by direction are identified in the respective subsections.

In terms of all truck directions combined, the top five commodities include:

Tonnage:

- Nonmetallic Minerals (102.4 million tons, 20.5% of modal total)
- Secondary Traffic (84.0 million, 16.8%)
- Farm Products (82.2 million, 16.4%)
- Food or Kindred Products (57.5 million, 11.5%)
- Chemicals or Allied Products (41.8 million, 8.4%)

Units:

- Shipping Containers (15.7 million units, 38.6% of modal total)
- Farm Products (4.9 million, 12.1%)
- Secondary Traffic (4.4 million, 10.9%)
- Nonmetallic Minerals (4.2 million, 10.4%)
- Food or Kindred Products (2.5 million, 6.2%)

⁴ the respective figures identify the top commodities by relative percentage of the depicted term (tons, units, or value), sequenced left-to-right in descending order; the same convention is applied for all modes

Appendix A: Attachments A-D

Value:

- Secondary Traffic (\$161.7 billion, 22.7% of modal total)
- Chemicals or Allied Products (\$73.0 billion, 10.3%)
- Food or Kindred Products (\$71.0 billion, 10.0%)
- Machinery (\$53.2 billion, 7.5%)
- Transportation Equipment (\$50.3 billion, 7.1%)

Appendix A: Attachments A-D

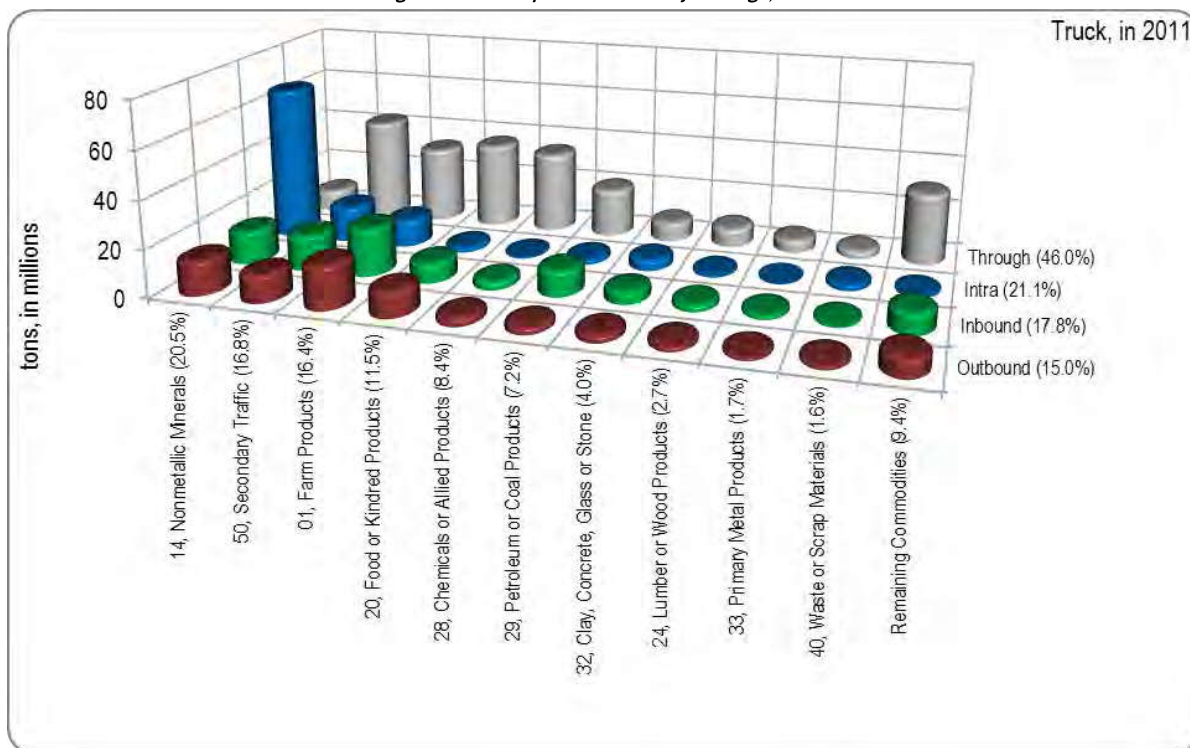
Figure 7: Truck Density, 2011



Source: prepared by CDM Smith, based on TRANSEARCH® data for 2011

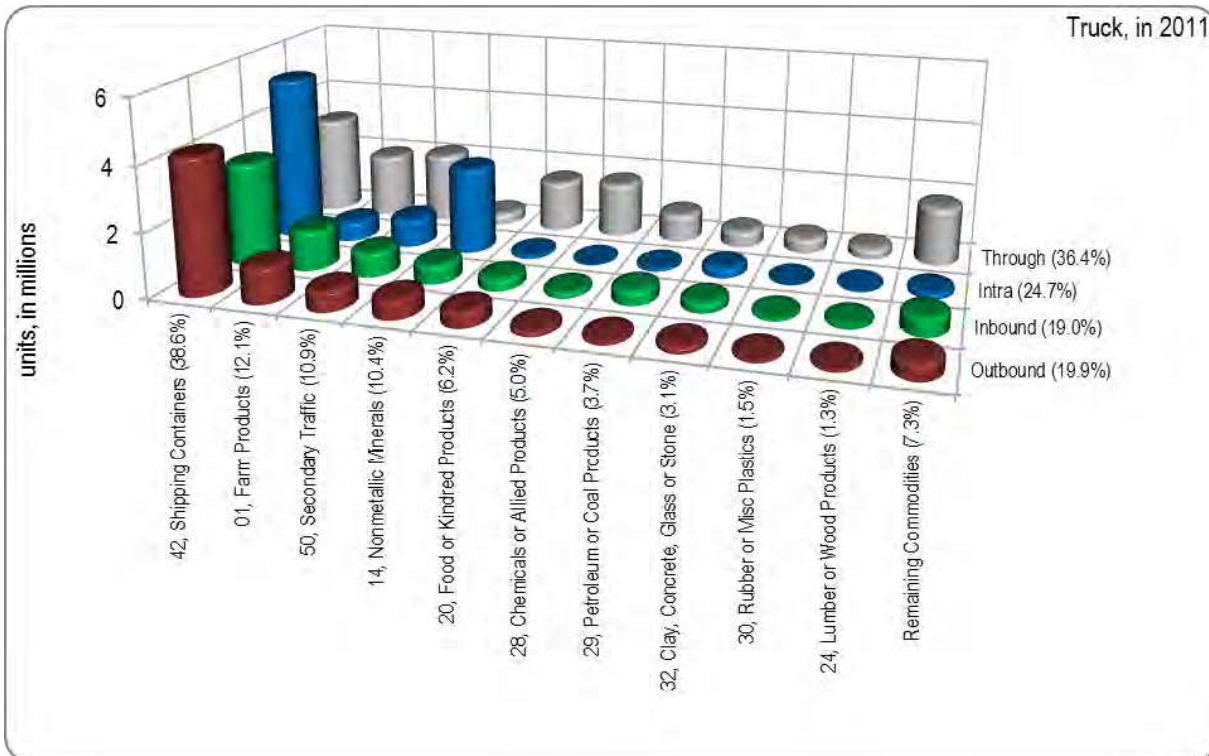
Appendix A: Attachments A-D

Figure 8: Truck Top Commodities by Tonnage, 2011



Source: prepared by CDM Smith, based on TRANSEARCH® data for 2011

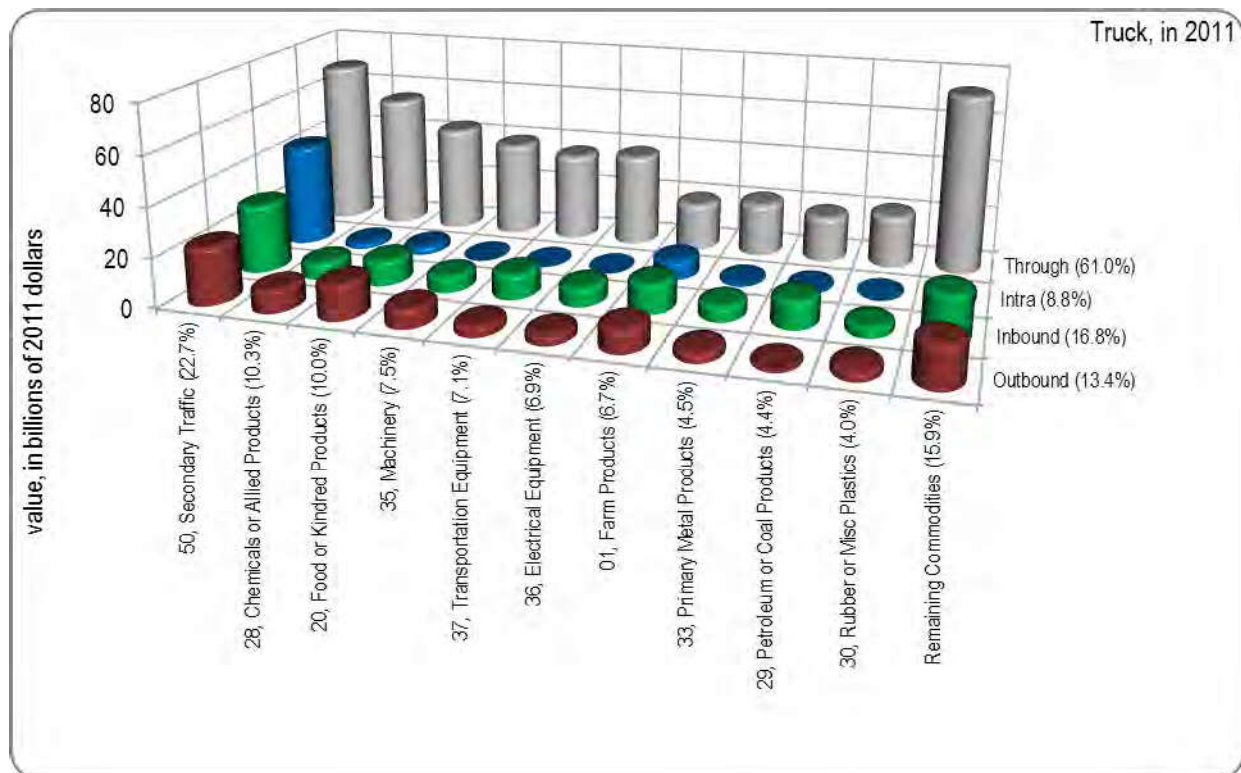
Figure 9: Truck Top Commodities by Units, 2011



Source: prepared by CDM Smith, based on TRANSEARCH® data for 2011

Appendix A: Attachments A-D

Figure 10: Truck Top Commodities by Value, 2011



Source: prepared by CDM Smith, based on TRANSEARCH® data for 2011

• Truck Outbound

Table 15 at the end of this document presents outbound truck commodities from Missouri, in 2011, which total 75.3 million tons (15.0% of directional movements), via 8.1 million units (19.9%), valued at \$95.0 billion (13.4%), with an average value/ton of \$1,262; top five commodities include:

Tonnage:

- Farm Products (17.9 million tons, 23.8% of outbound total)
- Nonmetallic Minerals (14.4 million, 19.1%)
- Secondary Traffic (11.3 million, 14.9%)
- Food or Kindred Products (10.5 million, 14.0%)
- Chemicals or Allied Products (3.3 million, 4.4%)

Units:

- Shipping Containers (4.2 million units, 52.1% of outbound total)
- Farm Products (1.1 million, 13.6%)
- Secondary Traffic (0.6 million, 7.7%)
- Nonmetallic Minerals (0.6 million, 7.3%)
- Food or Kindred Products (0.5 million, 5.7 %)

Appendix A: Attachments A-D

Value:

- Secondary Traffic (\$23.1 billion, 24.3% of outbound total)
- Food or Kindred Products (\$14.2 billion, 14.9%)
- Farm Products (\$9.2 billion, 9.7%)
- Chemicals or Allied Products (\$9.2 billion, 9.6%)
- Machinery (\$7.5 billion, 7.9%)

Outbound Tonnage Origin - Major outbound truck tonnages in 2011 are shown by county origin in **Figure 11** and **Figure 13**. Truck movements destined out-of-state are primarily traveling from Jackson County (7.3 million, 9.8%), St. Louis County (7.1 million, 9.4%), and St. Louis City (6.1 million, 8.1%).

Jackson County:

- Secondary Traffic (3.4 million tons, 46.4% of outbound county total)
- Food or Kindred Products (0.9 million, 12.1%)
- Nonmetallic Minerals (0.6 million, 8.8%)

St. Louis County:

- Nonmetallic Minerals (3.3 million tons, 46.7% of outbound county total)
- Food or Kindred Products (0.8 million, 11.7%)
- Secondary Traffic (0.8 million, 10.9%)

St. Louis City:

- Secondary Traffic (3.3 million tons, 54.9% of outbound county total)
- Food or Kindred Products (1.0 million, 16.3%)
- Waste or Scrap Materials (0.6 million, 9.4%)

Outbound Tonnage Destination - Major outbound truck tonnages in 2011 are shown by state destination in **Figure 12** and **Figure 13**. Truck movements destined out-of-state are primarily traveling to Illinois (18.1 million, 24.0%), Kansas (12.7 million, 16.8%), and Arkansas (7.2 million, 9.6%).

Illinois:

- Nonmetallic Minerals (7.1 million tons, 39.3% of outbound state total)
- Farm Products (5.1 million, 28.0%)
- Secondary Traffic (1.8 million, 9.7%)

Kansas:

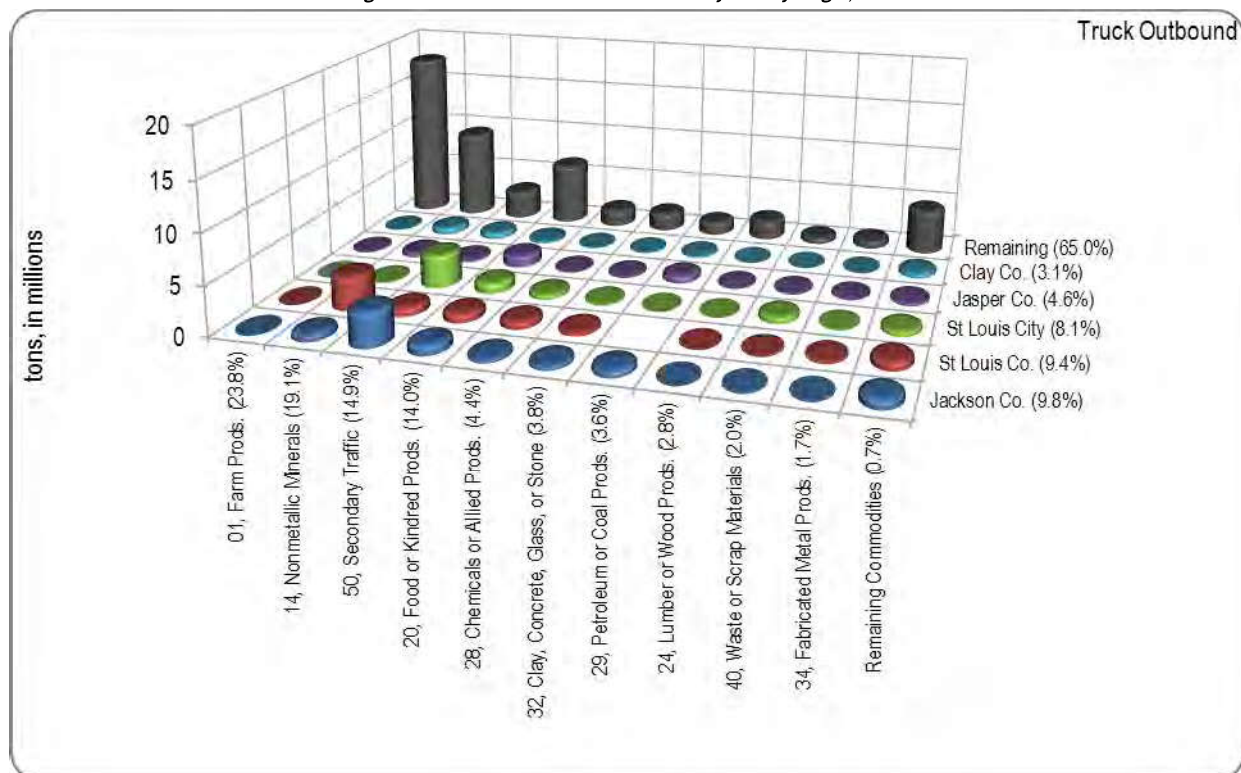
- Nonmetallic Minerals (3.9 million tons, 31.0% of outbound state total)
- Secondary Traffic (2.1 million, 16.8%)
- Farm Products (1.7 million, 13.5%)

Arkansas:

- Nonmetallic Minerals (2.5 million tons, 34.6% of outbound state total)
- Farm Products (1.8 million, 24.7%)
- Food or Kindred Products (1.0 million, 14.3%)

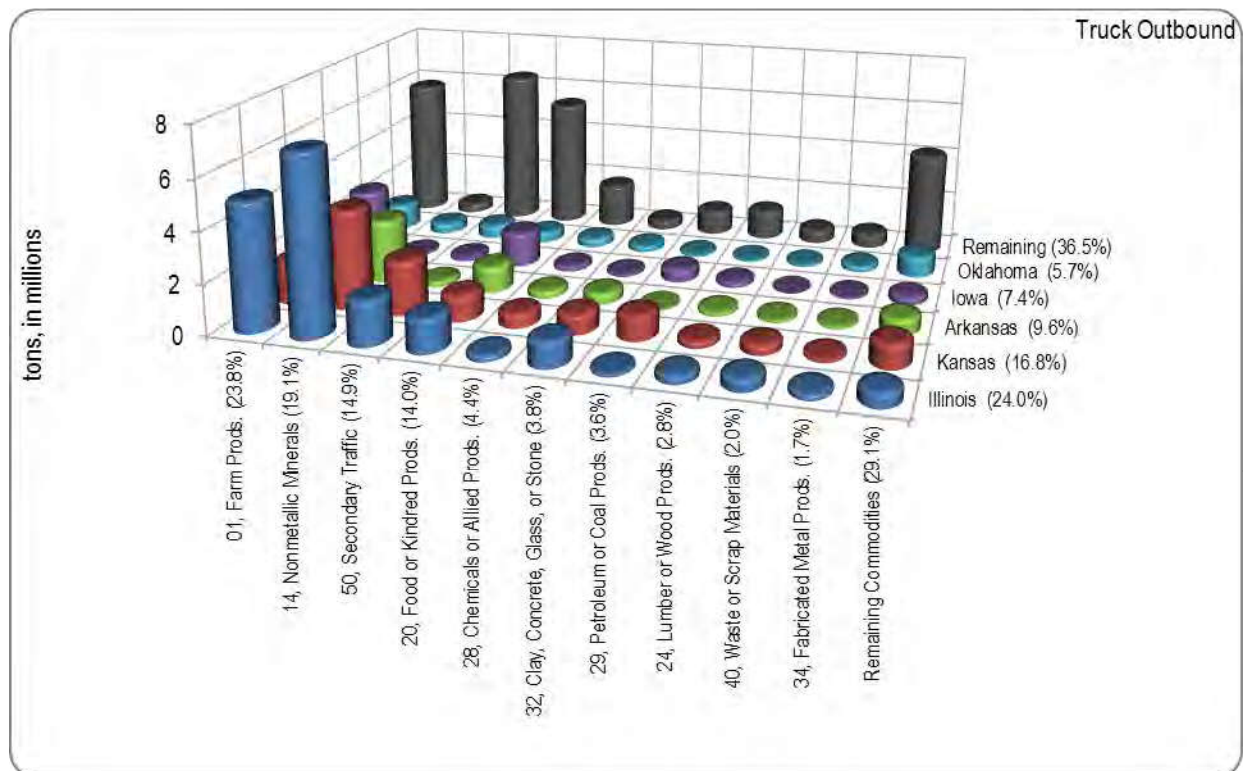
Appendix A: Attachments A-D

Figure 11: Truck Outbound Commodities by County Origin, 2011



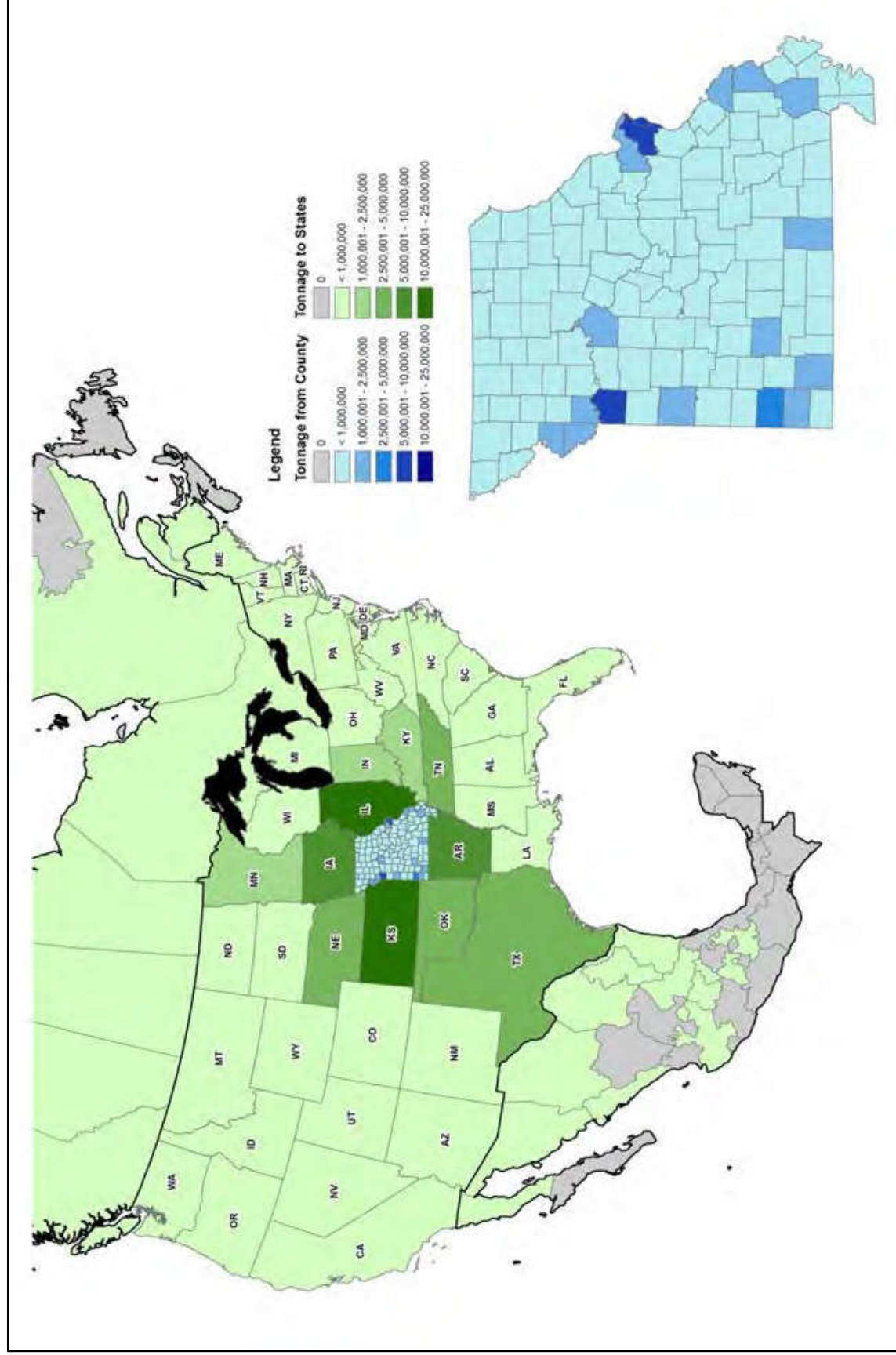
Source: prepared by CDM Smith, based on TRANSEARCH® data for 2011

Figure 12: Truck Outbound Commodities by State Destination, 2011



Source: prepared by CDM Smith, based on TRANSEARCH® data for 2011

Figure 13: Truck Outbound by Origin and Destination, 2011



Source: prepared by CDM Smith, based on TRANSEARCH® data for 2011



Appendix A: Attachments A-D

Truck Inbound

Table 16 at the end of this document presents inbound truck commodities to Missouri, in 2011, which total 89.3 million tons (17.8% of directional movements), via 7.7 million units (19.0%), valued at \$119.7 billion (16.8%), with an average value/ton of \$1,342; the top five commodities include:

Tonnage:

- Farm Products (20.1 million tons, 22.6% of inbound total)
- Secondary Traffic (14.6 million, 16.4%)
- Nonmetallic Minerals (13.8 million, 15.4%)
- Petroleum or Coal Products (10.6 million, 11.9%)
- Food or Kindred Products (8.3 million, 9.3%)

Units:

- Shipping Containers (3.2 million units, 41.2% of inbound total);
- Farm Products (1.2 million, 16.0%);
- Secondary Traffic (0.8 million, 9.8%);
- Nonmetallic Minerals (0.6 million, 7.3%); and,
- Petroleum or Coal Products (0.4 million, 5.7%)

Value:

- Secondary Traffic (\$27.9 billion, 23.3% of inbound total);
- Farm Products (\$11.7 billion, 9.8%);
- Petroleum or Coal Products (\$10.9 billion, 9.1%);
- Food or Kindred Products (\$10.0 billion, 8.4%); and,
- Transportation Equipment (\$9.9 billion, 8.3%)

Inbound Tonnage Origin - Major inbound truck tonnages in 2011 are shown by state origin in **Figure 14** and **Figure 16**. Truck movements originating out-of-state are primarily traveling from Illinois (22.1 million, 24.7%), Kansas (17.4 million, 19.5%), and Iowa (7.9 million, 8.8%).

Illinois:

- Nonmetallic Minerals (6.8 million tons, 30.7% of inbound state total)
- Petroleum or Coal Products (3.9 million, 17.5%); and,
- Farm Products (3.8 million, 17.4%)

Kansas:

- Petroleum or Coal Products (4.6 million tons, 26.4% of inbound state total);
- Nonmetallic Minerals (4.3 million, 24.6%); and,
- Secondary Traffic (3.8 million, 21.6%)

Iowa:

- Farm Products (4.3 million tons, 55.1% of inbound state total);
- Nonmetallic Minerals (1.1 million, 14.2%); and,
- Food or Kindred Products (0.8 million, 9.6%)

Inbound Tonnage Destination - Major inbound truck tonnages in 2011 are shown by county destination in **Figure 15** and **Figure 16**. Truck movements originating out-of-state are primarily traveling to Jackson County (13.0 million, 14.6%), St. Louis County (11.4 million, 12.8%), and St. Louis City (9.7 million, 10.9 %).

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Jackson County:

- Petroleum or Coal Products (3.2 million tons, 24.9% of inbound county total)
- Secondary Traffic (2.9 million, 22.3%)
- Nonmetallic Minerals (2.2 million, 16.9%)

St. Louis County:

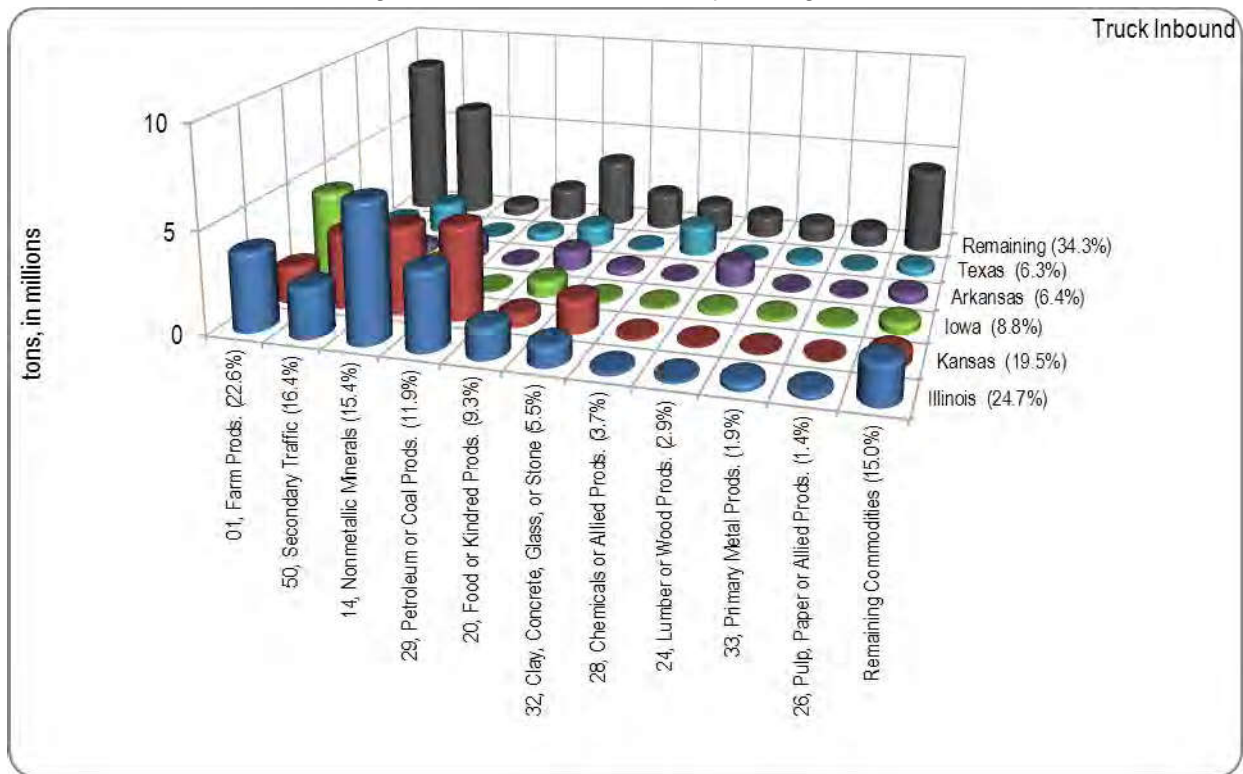
- Secondary Traffic (2.4 million tons, 21.2% of inbound county total);
- Nonmetallic Minerals (1.8 million, 16.0%); and,
- Petroleum or Coal Products (1.5 million, 12.7%)

St. Louis City:

- Secondary Traffic (2.1 million tons, 21.8% of inbound county total)
- Petroleum or Coal Products (2.0 million, 21.0%)
- Farm Products (1.9 million, 19.8%)

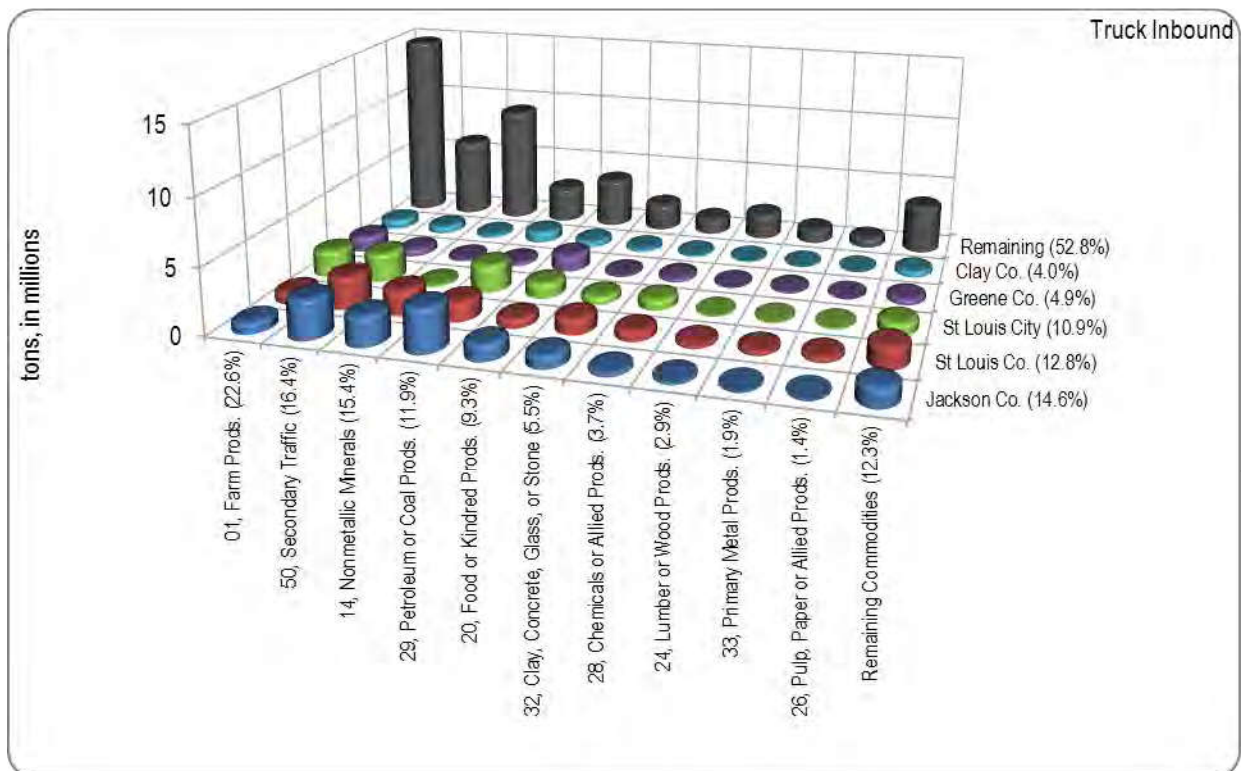
Appendix A: Attachments A-D

Figure 14: Truck Inbound Commodities by State Origin, 2011



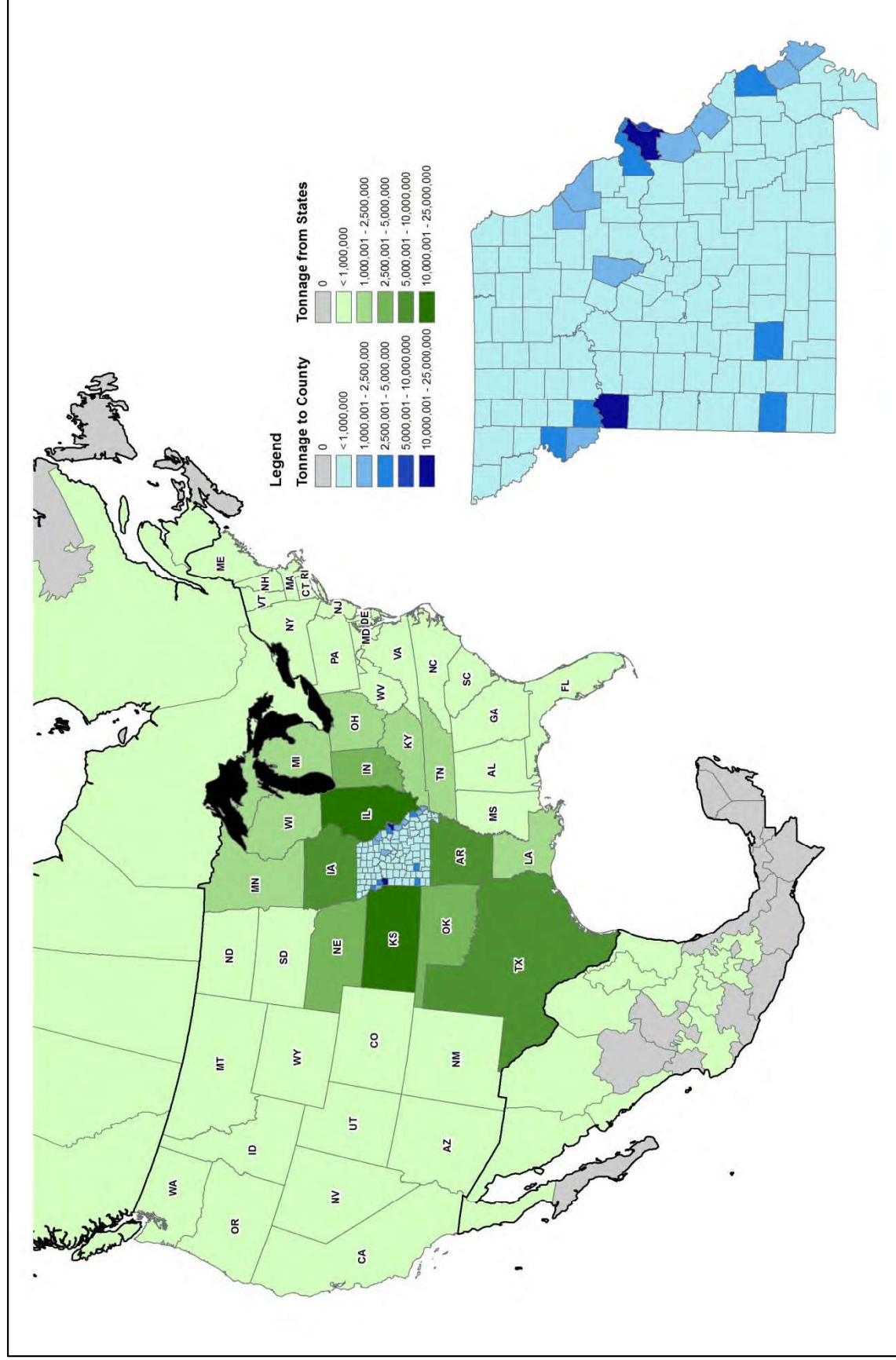
Source: prepared by CDM Smith, based on TRANSEARCH® data for 2011

Figure 15: Truck Inbound Commodities by County Destination, 2011



Source: prepared by CDM Smith, based on TRANSEARCH® data for 2011

Figure 16: Truck Inbound by Origin and Destination, 2011



Source: prepared by CDM Smith, based on TRANSEARCH® data for 2011



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Truck Intra

Table 17 at the end of this document presents intrastate truck commodities within Missouri in 2011, which total 105.6 million tons (21.1% of directional movements), via 10.0 million units (24.7%), valued at \$62.3 billion (8.8%), with an average value/ton of \$590; the top five commodities include:

Tonnage:

- Nonmetallic Minerals (65.5 million tons, 62.0% of intrastate total)
- Secondary Traffic (14.7 million, 13.9%)
- Farm Products (11.5 million, 10.8%)
- Clay, Concrete, Glass, or Stone (4.4 million, 4.2%)
- Waste or Scrap Materials (2.3 million, 2.2%)

Units:

- Shipping Containers (5.2 million units, 51.5% of intrastate total)
- Nonmetallic Minerals (2.7 million, 26.9%)
- Secondary Traffic (0.9 million, 8.7%)
- Farm Products (0.6 million, 5.9%)
- Clay, Concrete, Glass, or Stone (0.3 million, 2.8%)

Value:

- Secondary Traffic (\$42.2 billion, 67.6% of intrastate total);
- Farm Products (\$7.6 billion, 12.2%);
- Food or Kindred Products (\$3.1 billion, 5.0%);
- Chemical or Allied Products (\$2.1 billion, 3.4%); and,
- Petroleum or Coal Products (\$1.0 billion, 1.6%)

Truck Through

Table 18 at the end of this document presents through truck commodities moving across Missouri in 2011, which total 230.2 million tons (46.0% of directional movements), via 14.8 million units (36.4%), valued at \$433.8 billion (61.0%), with an average value/ton of \$1,884; the top five commodities include:

Tonnage:

- Secondary Traffic (43.4 million tons, 18.8% of through total)
- Food or Kindred Products (36.5 million, 15.9%)
- Chemicals or Allied Products (34.6 million, 15.0%)
- Farm Products (32.7 million, 14.2%)
- Petroleum or Coal Products (20.4 million, 8.8%)

Units:

- Shipping Containers (3.1 million units, 21.0% of through total)
- Secondary Traffic (2.2 million, 14.8%)
- Farm Products (2.0 million, 13.4%)
- Chemical or Allied Products (1.7 million, 11.5%)
- Food or Kindred Products (1.6 million, 10.8%)

Value:

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- Secondary Traffic (\$68.5 billion, 15.8% of through total)
- Chemical or Allied Products (\$55.1 billion, 12.7%)
- Food or Kindred Products (\$43.7 billion, 10.1%)
- Machinery (\$39.1 billion, 9.0%)
- Electrical Equipment (\$37.9 billion, 8.7%)

Rail, 2011

Missouri rail movements in 2011 totaled 458.1 million tons, valued at \$465.0 billion, and carried within 8.2 million units (see **Table 5**). On average, total rail commodity movements are valued at \$1,015/ton. Rail movements represent 45.1% of modal tonnage in Missouri and 38.6% of total modal value in 2011, the second largest relative share.

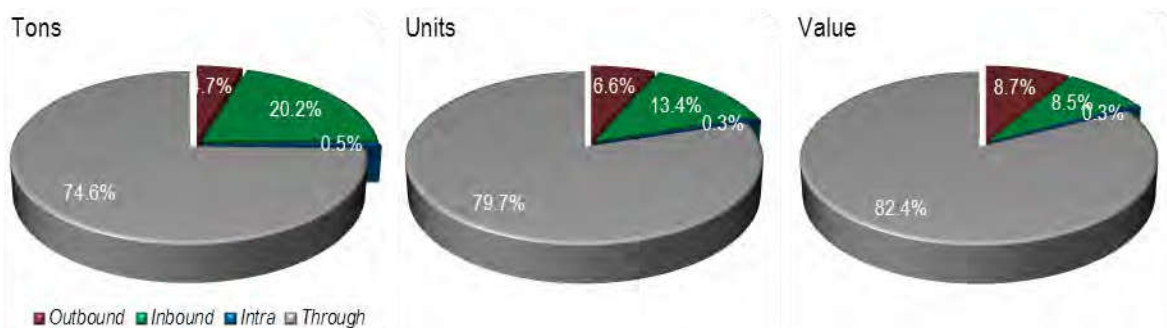
As depicted in **Figure 17**, through rail movements dominate directional movements: 74.6% of total tonnage, 79.7% of units, and 82.4% of value. Outbound, inbound, and intrastate movements, combined, comprise the remaining 25.4% of tons and 17.6% of value.

Table 5: Rail by Direction, 2011

Direction	Tons		Units		Value (in millions)		Average Value/Ton
	Amount	Percent	Amount	Percent	Amount	Percent	
Outbound	21,510,433	4.7%	539,145	6.6%	\$40,364	8.7%	\$1,876
Inbound	92,326,793	20.2%	1,100,284	13.4%	\$39,647	8.5%	\$429
Intra	2,436,087	0.5%	25,780	0.3%	\$1,616	0.3%	\$663
Through	341,805,597	74.6%	6,554,377	79.7%	\$383,409	82.4%	\$1,122
Total	458,078,910	100.0%	8,219,586	100.0%	\$465,035	100.0%	\$1,015

Source: prepared by CDM Smith, based on TRANSEARCH® data for 2011

Figure 17: Rail Percentages by Direction, 2011



Source: prepared by CDM Smith, based on TRANSEARCH® data for 2011

Major rail freight corridors include routes served by the major Class 1 carriers, especially surrounding Kansas City, as seen in **Figure 18**; routes with the densest rail traffic include the Union Pacific line between Kansas City and St. Louis and the Burlington Southern-Santa Fe lines connecting Kansas City and Chicago, and between Kansas City and Wyoming (via Nebraska).

Figure 19, Figure 20, and Figure 21 depict the top two-digit STCC commodities for Missouri rail, by tonnage, units, and value, respectively, with a directional composition. Such graphics depict the largest respective commodity movements for rail by direction, and in conjunction with the tabulated data in **Table 19** through **Table 22**, in the Appendix, the top rail commodity movements by direction are identified in the respective subsections.

In terms of all rail directions combined, the top five commodities include:

Tonnage:

- Coal (223.9 million tons, 48.9% of modal total);
- Food or Kindred Products (39.3 million, 8.6%);

Appendix A: Attachments A-D

- Chemicals or Allied Products (38.2 million, 8.3%)
- Miscellaneous Mixed Shipments (37.2 million, 8.1%)
- Farm Products (36.2 million, 7.9 %)

Units:

- Miscellaneous Mixed Shipments (2.6 million units, 31.9% of modal total);
- Coal (1.9 million, 22.9%);
- Transportation Equipment (0.7 million, 8.4%);
- Food or Kindred Products (0.6 million, 6.9%); and,
- Farm Products (0.5 million, 6.0%)

Value:

- Miscellaneous Mixed Shipments (\$186.9 billion, 40.2% of modal total);
- Transportation Equipment (\$111.1 billion, 23.9%);
- Chemicals or Allied Products (\$56.9 billion, 12.2%);
- Food or Kindred Products (\$28.3 billion, 6.1%); and,
- Primary Metal Products (\$18.2 billion, 3.9%)

Appendix A: Attachments A-D

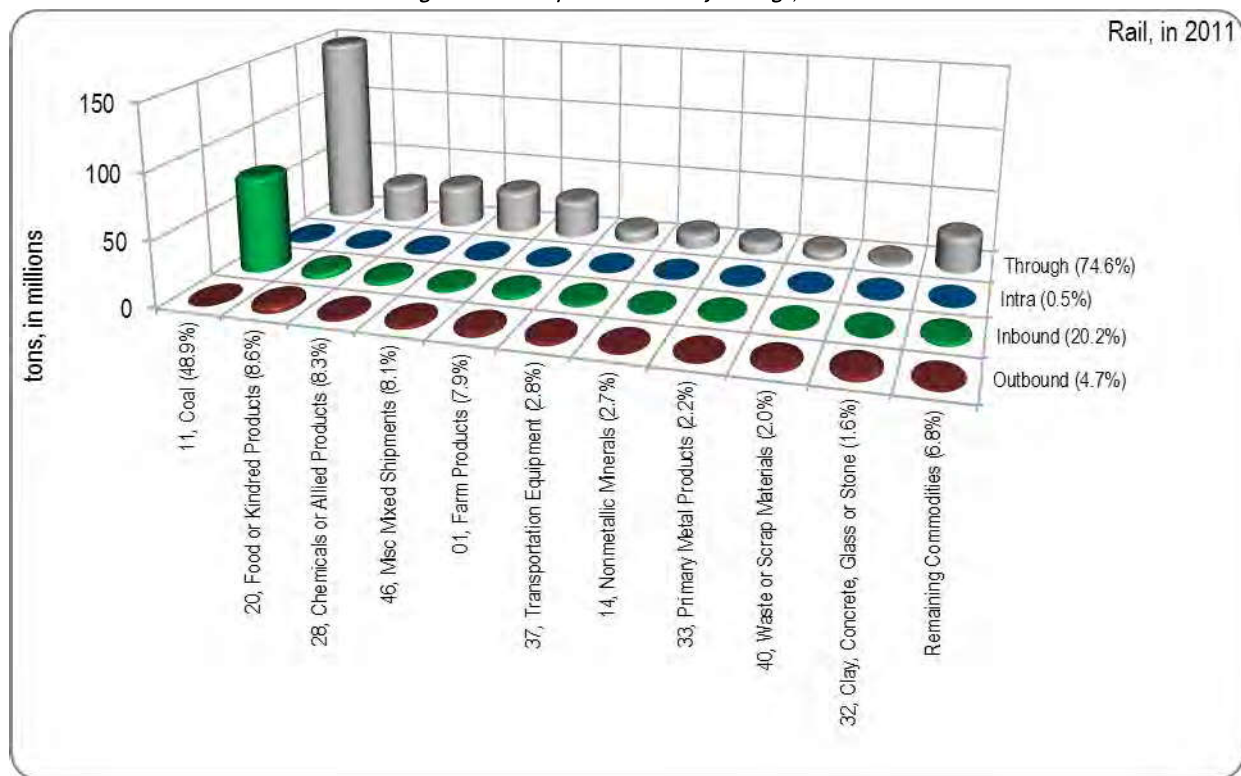
Figure 18: Rail Density, 2011



Source: prepared by CDM Smith, based on TRANSEARCH[®] data for 2011

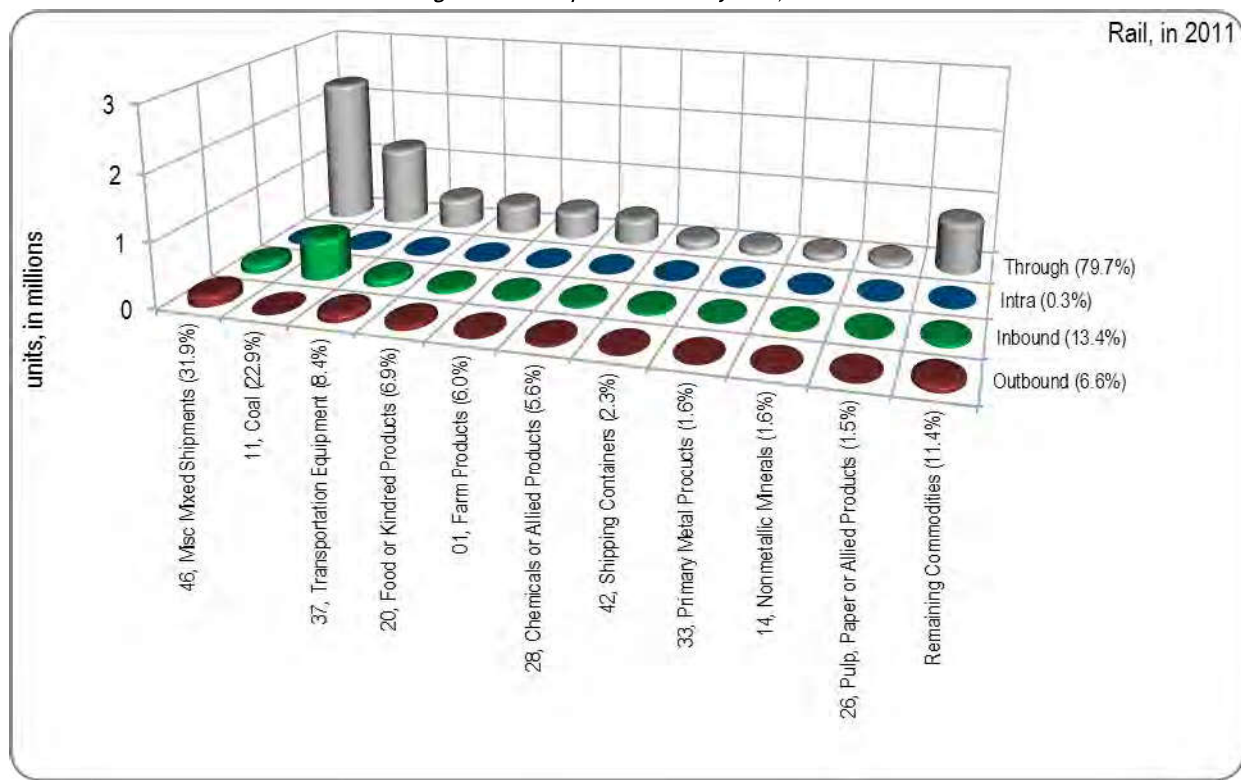
Appendix A: Attachments A-D

Figure 19: Rail Top Commodities by Tonnage, 2011



Source: prepared by CDM Smith, based on TRANSEARCH® data for 2011

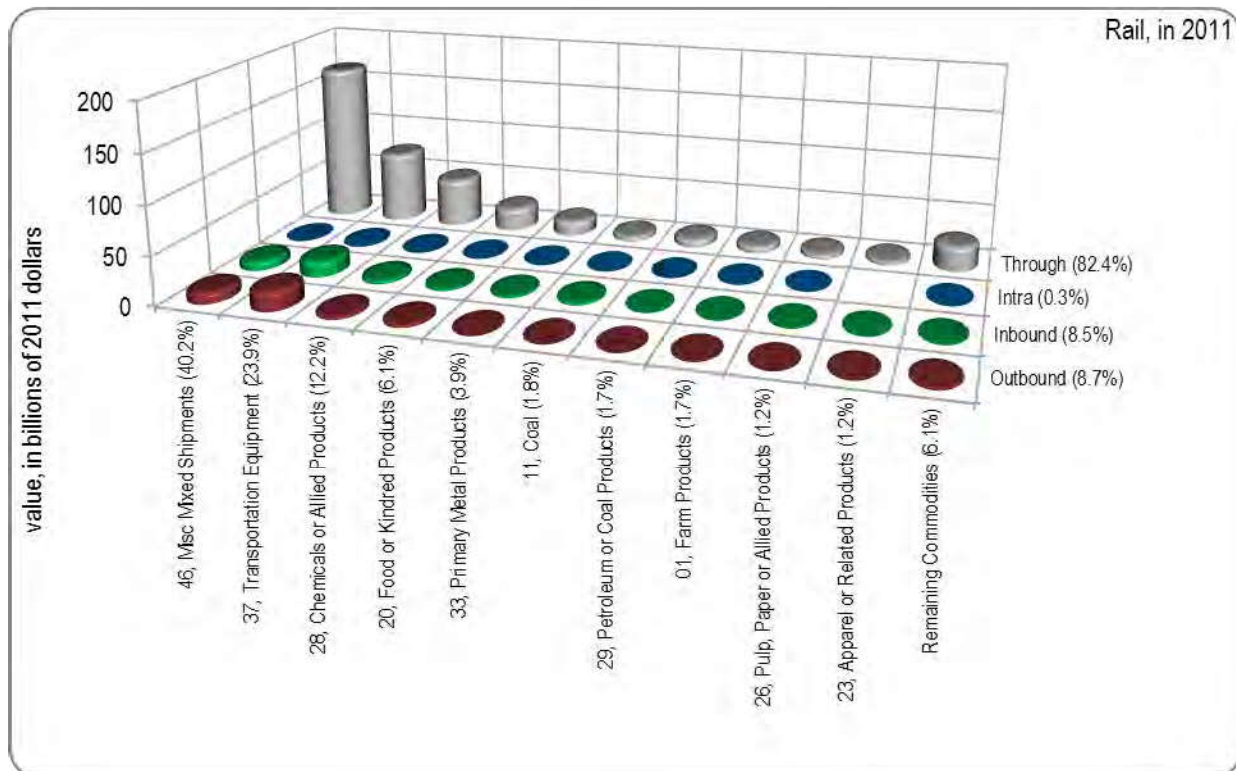
Figure 20: Rail Top Commodities by Units, 2011



Source: prepared by CDM Smith, based on TRANSEARCH® data for 2011

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Figure 21: Rail Top Commodities by Value, 2011



Source: prepared by CDM Smith, based on TRANSEARCH® data for 2011

Rail Outbound

Table 19 at the end of this document presents outbound rail commodities from Missouri in 2011, which total 21.5 million tons (4.7% of directional movements), via 539,145 units (6.6%), valued at \$40.4 billion (8.7%), with an average value/ton of \$1,876; the top five commodities include:

Tonnage:

- Food or Kindred Products (5.0 million tons, 23.2% of outbound total);
- Clay, Concrete, Glass, or Stone (3.1 million, 14.6%);
- Farm Products (3.1 million, 14.2%);
- Miscellaneous Mixed Shipments (2.3 million, 10.5%); and,
- Waste or Scrap Materials (2.1 million, 9.7%)

Units:

- Miscellaneous Mixed Shipments (173,840 units, 32.2% of outbound total);
- Transportation Equipment (115,230, 21.4%);
- Food or Kindred Products (70,897, 13.1%);
- Clay, Concrete, Glass, or Stone (32,596, 6.0%); and,
- Farm Products (29,810, 5.5%)

Value:

- Transportation Equipment (\$19.4 billion, 47.9% of outbound total);
- Miscellaneous Mixed Shipments (\$11.2 billion, 27.7%);
- Chemicals or Allied Products (\$3.1 billion, 7.6%);

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- Food or Kindred Products (\$2.8 billion, 6.9%); and,
- Primary Metal Products (\$0.7 billion, 1.8%)

Outbound Tonnage Origin - Major outbound rail tonnages in 2011 are shown by county origin in **Figure 22** and **Figure 24**. Rail movements destined out-of-state are primarily traveling from Jackson County (10.2 million, 47.3%), St. Louis City (3.0 million, 13.8%), and Ste. Genevieve County (1.5 million, 6.8%).

Jackson County:

- Food or Kindred Products (3.2 million tons, 31.3% of outbound county total);
- Miscellaneous Mixed Shipments (1.7 million, 16.7%); and,
- Transportation Equipment (1.3 million, 13.2%)

St. Louis City:

- Waste or Scrap Materials (0.9 million tons, 28.8% of outbound county total);
- Chemicals or Allied Products (0.7 million, 22.7%); and,
- Miscellaneous Mixed Shipments (0.6 million, 19.0%)

Ste. Genevieve County:

- Clay, Concrete, Glass, or Stone (1.5 million tons, 99.2% of outbound county total);
- Chemicals or Allied Products (6,320, 0.4%); and,
- Transportation Equipment (5,520, 0.4%)

Outbound Tonnage Destination - Major outbound rail tonnages in 2011 are shown by state destination in **Figure 23** and **Figure 24**. Rail movements destined out-of-state are primarily traveling to Texas (3.9 million, 18.1%), California (2.0 million, 9.3%), and Illinois (1.4 million, 6.7%).

Texas:

- Food or Kindred Products (1.8 million tons, 45.3% of outbound state total);
- Farm Products (0.7 million, 18.1%); and,
- Clay, Concrete, Glass, or Stone (0.6 million, 14.8%)

California:

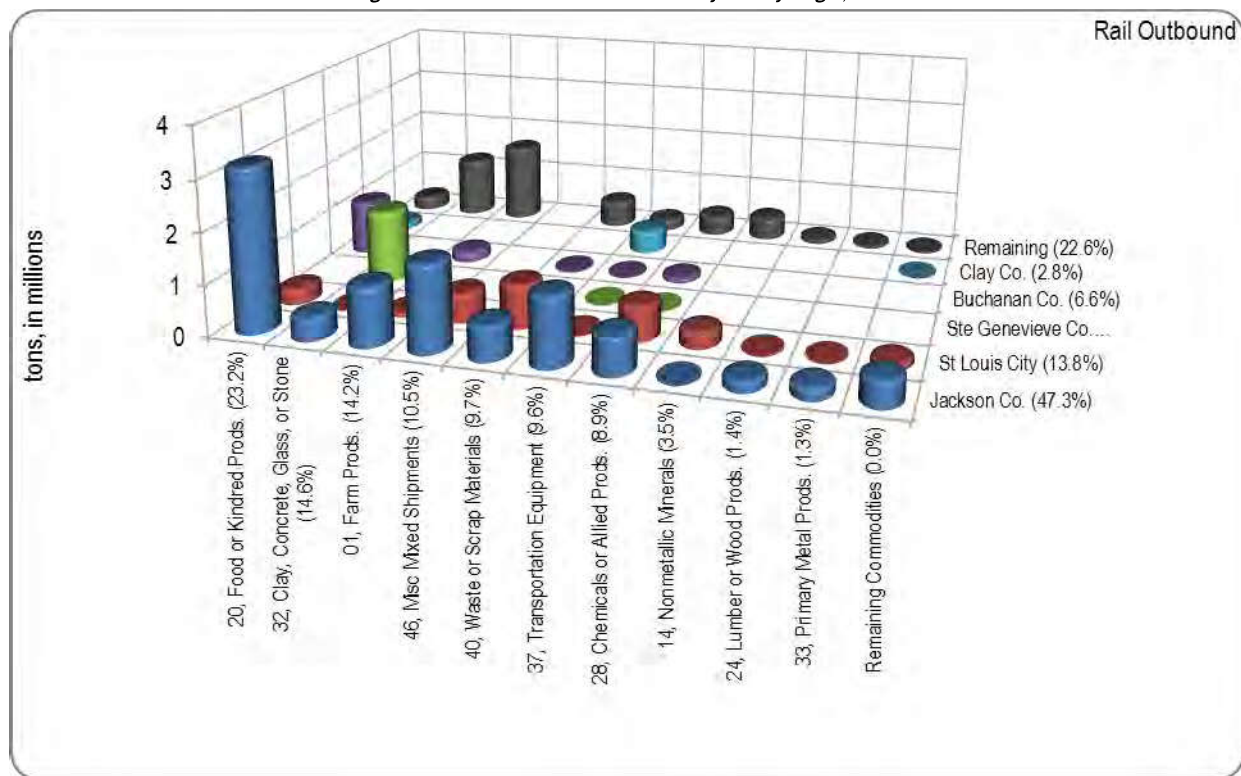
- Miscellaneous Mixed Shipments (0.7 million tons, 35.7% of outbound state total);
- Transportation Equipment (0.4 million, 18.7%); and,
- Food and Kindred Products (0.3 million, 13.8%)

Illinois:

- Transportation Equipment (0.3 million tons, 21.3% of outbound state total);
- Chemicals or Allied Products (0.3 million, 18.1%); and,
- Nonmetallic Minerals (0.2 million, 15.1%)

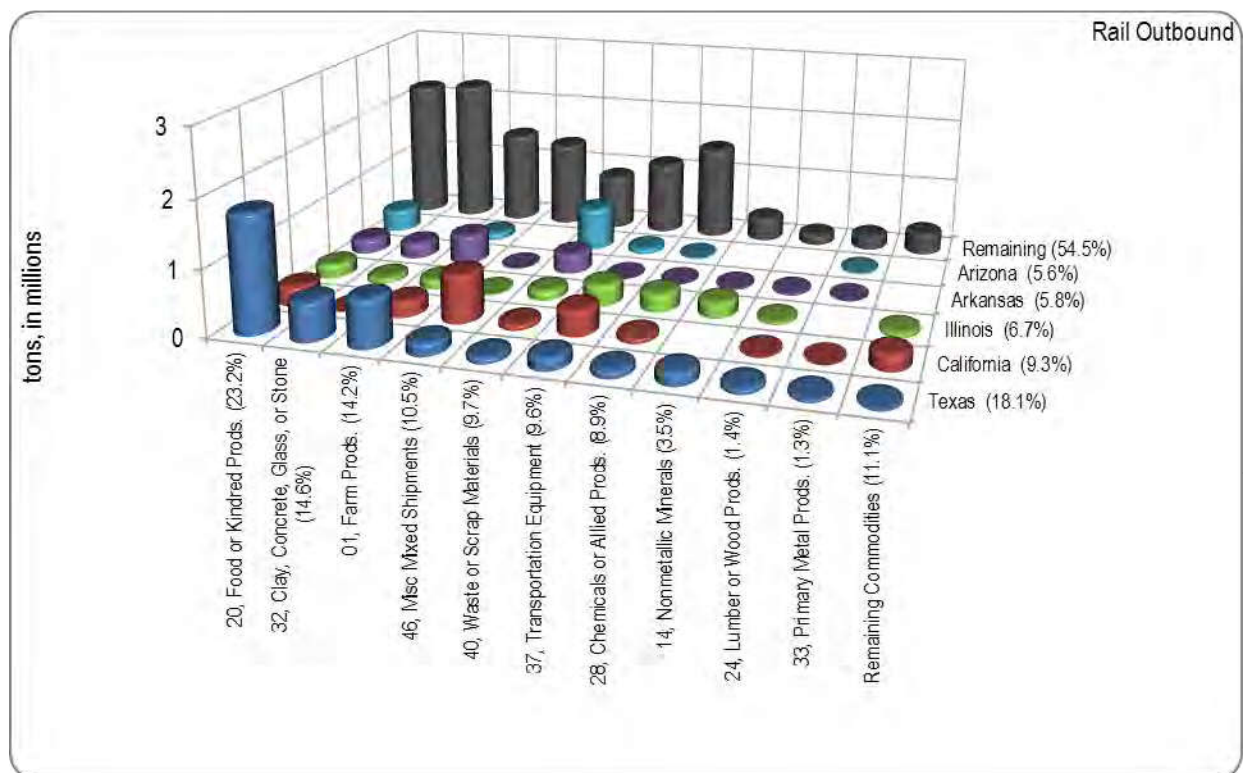
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Figure 22: Rail Outbound Commodities by County Origin, 2011



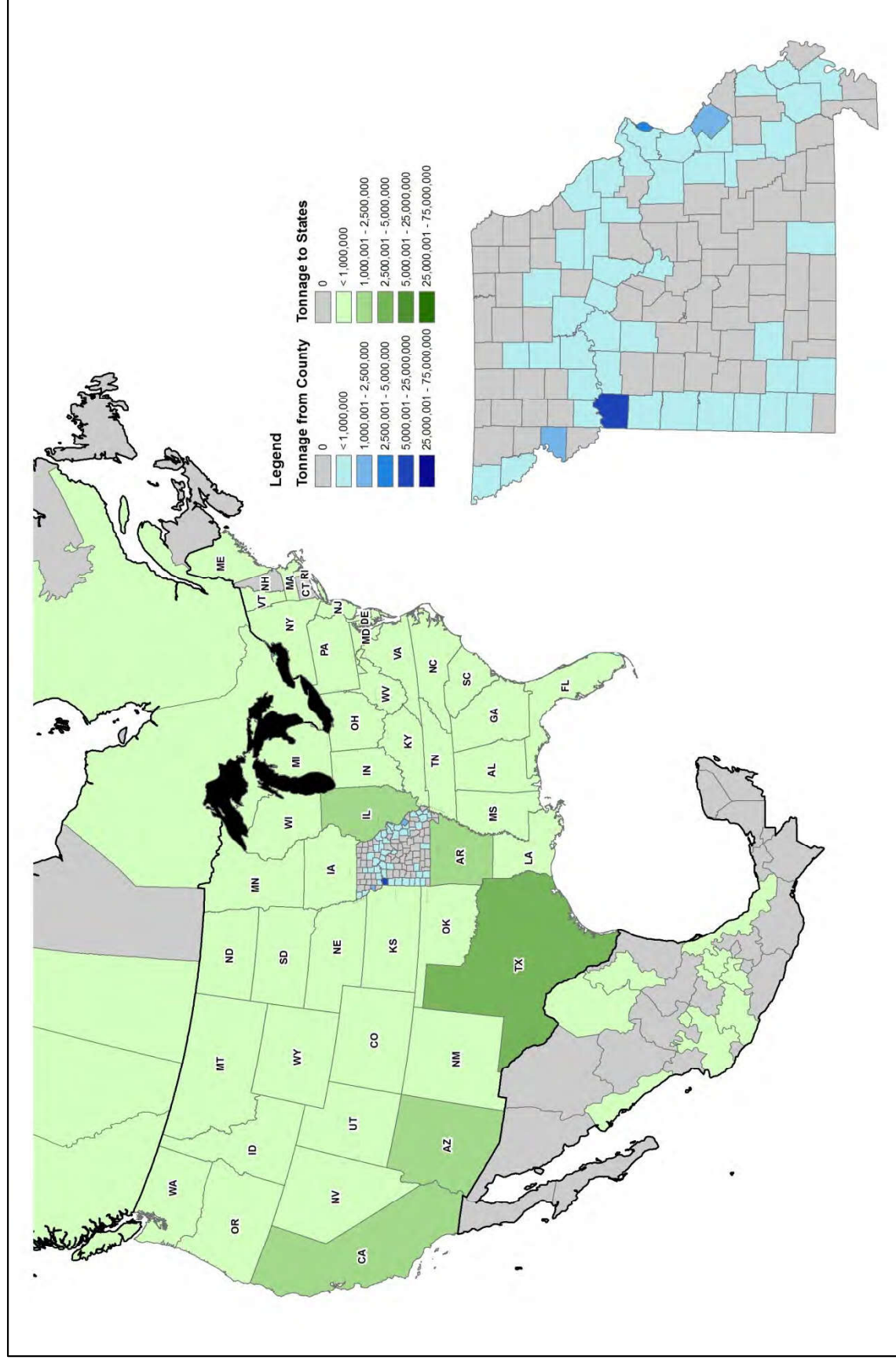
Source: prepared by CDM Smith, based on TRANSEARCH® data for 2011

Figure 23: Rail Outbound Commodities by State Destination, 2011



Source: prepared by CDM Smith, based on TRANSEARCH® data for 2011

Figure 24: Rail Outbound by Origin and Destination, 2011



Source: prepared by CDM Smith, based on TRANSEARCH® data for 2011



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Rail Inbound

Table 20 at the end of this document presents inbound rail commodities to Missouri in 2011, which total 92.3 million tons (20.2% of directional movements), via 1.1 million units (13.4%), valued at \$39.6 billion (8.5%), with an average value/ton of \$429; top five commodities include:

Tonnage:

- Coal (74.0 million tons, 80.2% of inbound total);
- Food or Kindred Products (4.0 million, 4.4%);
- Farm Products (2.9 million, 3.2%);
- Chemicals or Allied Products (2.9 million, 3.1%); and,
- Transportation Equipment (1.9 million, 2.1%)

Units:

- Coal (619,890 units, 56.3% of inbound total);
- Miscellaneous Mixed Shipments (150,320, 13.7%);
- Transportation Equipment (103,748, 9.4%);
- Food or Kindred Products (46,087, 4.2%); and,
- Shipping Containers (35,920, 3.3%)

Value:

- Transportation Equipment (\$16.0 billion, 40.4% of inbound total);
- Miscellaneous Mixed Shipments (\$9.2 billion, 23.2%);
- Chemicals or Allied Products (\$3.6 billion, 9.0%);
- Coal (\$2.7 billion, 6.8%); and,
- Primary Metal Products (\$2.2 billion, 5.6%)

Inbound Tonnage Origin - Major inbound rail tonnages in 2011 are shown by state origin in **Figure 25** and **Figure 27**. Rail movements originating out-of-state are primarily traveling from Wyoming (74.3 million, 80.5%), Illinois (2.0 million, 2.1%), and North Dakota (1.3 million, 1.4%).

Wyoming:

- Coal (73.7 million tons, 99.2% of inbound state total);
 - clearly, this is the critical rail movement for Missouri
- Chemicals or Allied Products (0.4 million, 0.6%); and,
- Clay, Concrete, Glass, or Stone (0.2 million, 0.2%)

Illinois:

- Food or Kindred Products (0.9 million tons, 46.9% of inbound state total);
- Transportation Equipment (0.2 million, 11.9%); and,
- Chemicals or Allied Products (0.2 million, 11.9%)

North Dakota:

- Farm Products (1.0 million tons, 73.4% of inbound state total);
- Food or Kindred Products (0.3 million, 24.4%); and,
- Chemicals or Allied Products (29,200, 2.2%)

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Inbound Tonnage Destination – Major inbound rail tonnages in 2011 are shown by county destination in **Figure 26** and **Figure 27**. Rail movements originating out-of-state are primarily traveling to Jackson County (28.4 million, 30.7%), St. Louis City (11.8 million, 12.8%), and Franklin County (11.7 million, 12.6%).

Jackson County:

- Coal (19.3 million tons, 68.0% of inbound county total);
- Food or Kindred Products (2.7 million, 9.4%); and,
- Miscellaneous Mixed Shipments (1.4 million, 4.8%)

St. Louis City:

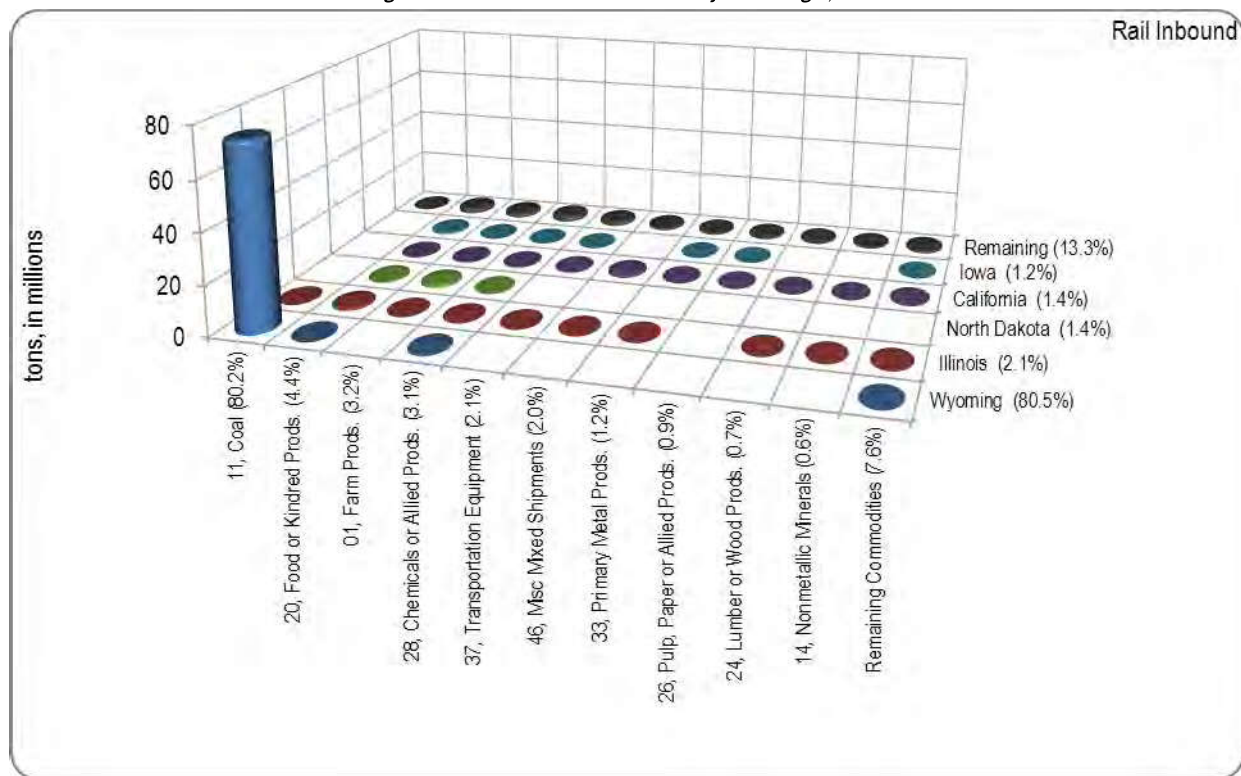
- Coal (7.6 million tons, 64.4% of inbound county total);
- Farm Products (1.5 million, 12.7%); and,
- Chemicals or Allied Products (1.0 million, 8.6%)

Franklin County:

- Coal (11.6 million tons, 99.8% of inbound county total);
- Chemicals or Allied Products (7,840, 0.1%); and,
- Pulp, Paper, or Allied Products (6,020, 0.1%)

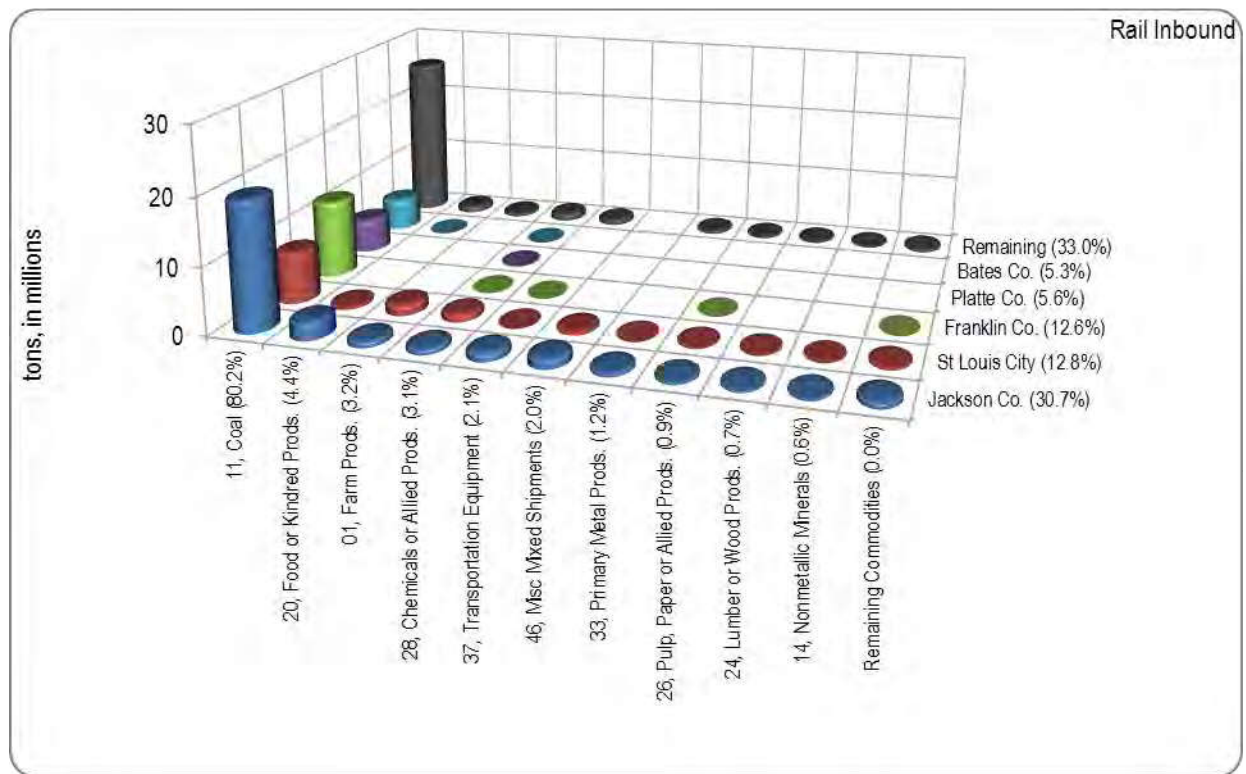
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Figure 25: Rail Inbound Commodities by State Origin, 2011



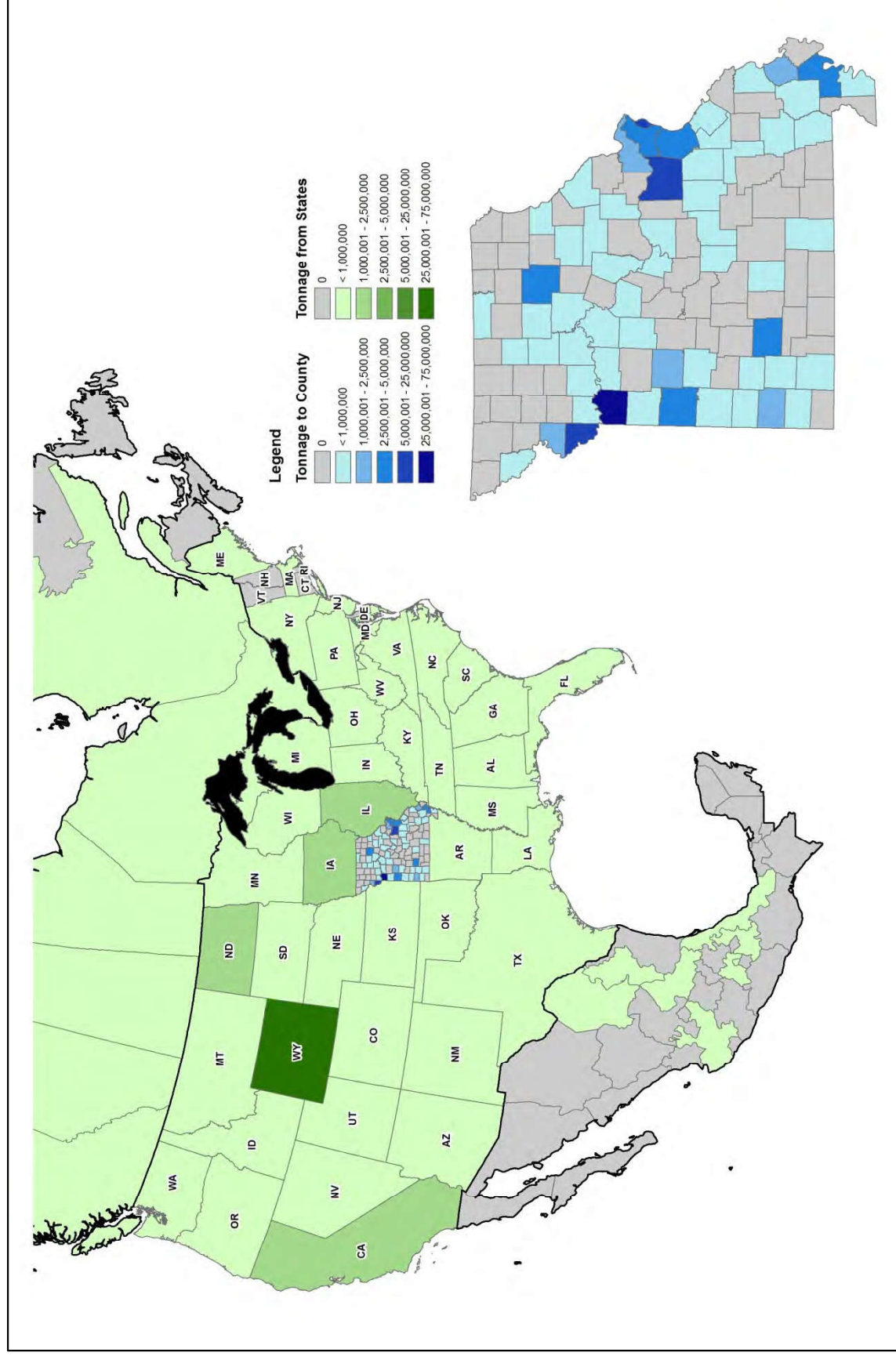
Source: prepared by CDM Smith, based on TRANSEARCH® data for 2011

Figure 26: Rail Inbound Commodities by County Destination, 2011



Source: prepared by CDM Smith, based on TRANSEARCH® data for 2011

Figure 27: Rail Inbound by Origin and Destination, 2011



Source: prepared by CDM Smith, based on TRANSEARCH® data for 2011



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Rail Intra

Table 21 at the end of this document presents intrastate rail commodities within Missouri in 2011, which total 2.4 million tons (0.5% of directional movements), via 25,780 units (0.3%), valued at \$1.6 billion (0.3%), with an average value/ton of \$663; the top five commodities include:

Tonnage:

- Coal (1.2 million tons, 50.2% of intrastate total);
- Clay, Concrete, Glass, or Stone (513,704, 21.1%);
- Farm Products (177,820, 7.3%);
- Nonmetallic Minerals (177,459, 7.3%); and,
- Food or Kindred Products (131,388, 5.4%)

Units:

- Coal (10,454, 40.6% of intrastate total);
- Clay, Concrete, Glass, or Stone (5,164, 20.0%);
- Transportation Equipment (3,090, 12.0%);
- Nonmetallic Minerals (2,180, 8.5%); and,
- Farm Products (1,712, 6.6%)

Value:

- Transportation Equipment (\$1.1 billion, 69.6% of intrastate total);
- Chemicals or Allied Products (\$192 million, 11.9%);
- Clay, Concrete, Glass, or Stone (\$86 million, 5.4%);
- Food or Kindred Products (\$80 million, 4.9%); and,
- Coal (\$45 million, 2.8%)

Rail Through

Table 22 at the end of this document presents through rail commodities moving across Missouri in 2011, which total 341.8 million tons (74.6% of directional movements), via 6.6 million units (79.7%), valued at \$383.4 billion (82.4%), with an average value/ton of \$1,122; the top five commodities include:

Tonnage:

- Coal (148.7 million tons, 43.5% of through total);
- Chemicals or Allied Products (33.3 million, 9.7%);
- Miscellaneous Mixed Shipments (33.1 million, 9.7%);
- Food or Kindred Products (30.1 million, 8.8%); and,
- Farm Products (30.0 million, 8.8%)

Units:

- Miscellaneous Mixed Shipments (2.3 million units, 35.0% of through total);
- Coal (1.3 million, 19.1%);
- Transportation Equipment (0.5 million, 7.2%);
- Food or Kindred Products (0.4 million, 6.8%); and,
- Farm Products (0.4 million, 6.5%)

Value:

- Miscellaneous Mixed Shipments (\$166.6 billion, 43.5% of through total);
- Transportation Equipment (\$74.6 billion, 19.5%);

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- Chemicals or Allied Products (\$50.1 billion, 13.1%);
- Food or Kindred Products (\$23.3 billion, 6.1%); and,
- Primary Metal Products (\$15.2 billion, 4.0%)

Port, 2011

Missouri port (waterborne) movements in 2011 totaled 49.9 million tons, valued at \$12.5 billion (Table 6). On average, total port commodity movements are valued at \$252/ton. Port movements represent 4.9% of modal tonnage in Missouri and 1.0% of total modal value in 2011, a small proportion relative to the dominant truck and rail modes.

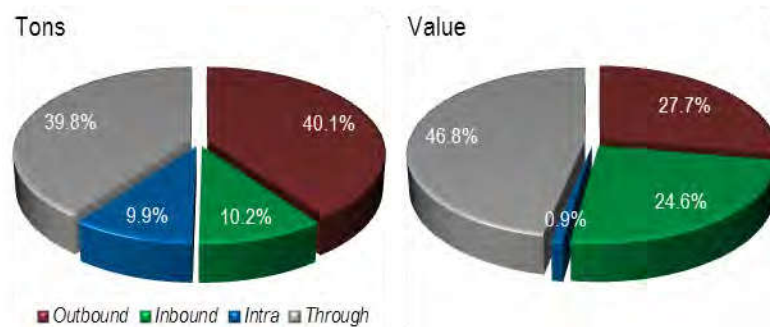
As depicted in Figure 28, outbound and through tonnage directions constitute the majority (and proportionally similar) directional movements: 40.1% and 39.8%, respectively, of total port tonnage. However, in terms of value, the through-based traffic is the relatively largest share, with outbound value not constituting similar percentages relating to tonnage because of the smaller value/ton metric for outbound port movements relative to through port movements. Intrastate port movements are relatively insignificant; but inbound comprises about a quarter of all value, despite a small tonnage percentage (due to relative high value/ton).

Table 6: Port by Direction, 2011

Direction	Tons		Value (in millions)		Average Value/Ton
	Amount	Percent	Amount	Percent	
Outbound	19,973,291	40.1%	\$3,479	27.7%	\$174
Inbound	5,093,847	10.2%	\$3,083	24.6%	\$605
Intra	4,941,503	9.9%	\$117	0.9%	\$24
Through	19,850,043	39.8%	\$5,870	46.8%	\$296
Total	49,858,684	100.0%	\$12,549	100.0%	\$252

Source: prepared by CDM Smith, based on TRANSEARCH® data for 2011

Figure 28: Port Percentages by Direction, 2011



Source: prepared by CDM Smith, based on TRANSEARCH® data for 2011

Appendix A: Attachments A-D

Figure 29 and **Figure 30** depict the top two-digit STCC commodities for Missouri port, by tonnage and value, respectively, with a directional composition. Such graphics depict the largest respective commodity movements for port by direction, and in conjunction with the tabulated data in **Table 23** through **Table 26**, in the Appendix, the top port commodity movements by direction are identified in the respective subsections.

In terms of all port directions combined, the top five commodities include:

Tonnage:

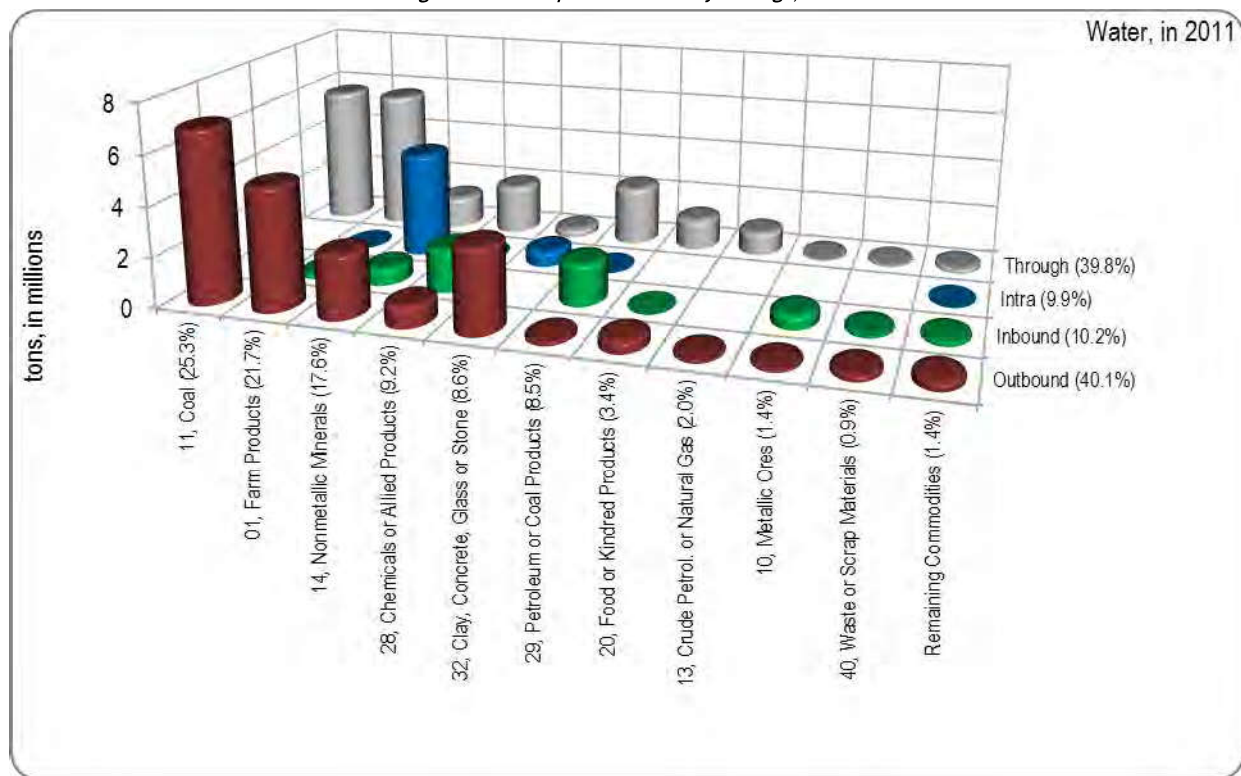
- Coal (12.6 million tons, 25.3% of modal total);
- Farm Products (10.8 million, 21.7%);
- Nonmetallic Minerals (8.8 million, 17.6%);
- Chemicals or Allied Products (4.6 million, 9.2%); and,
- Clay, Concrete, Glass, or Stone (4.3 million, 8.6%)

Value:

- Chemicals or Allied Products (\$3.5 billion, 27.8% of modal total);
- Petroleum or Coal Products (\$3.0 billion, 24.2%);
- Farm Products (\$2.1 billion, 17.1%);
- Crude Petroleum or Natural Gas (\$0.7 billion, 5.6%); and,
- Food or Kindred Products (\$0.6 billion, 4.5%)

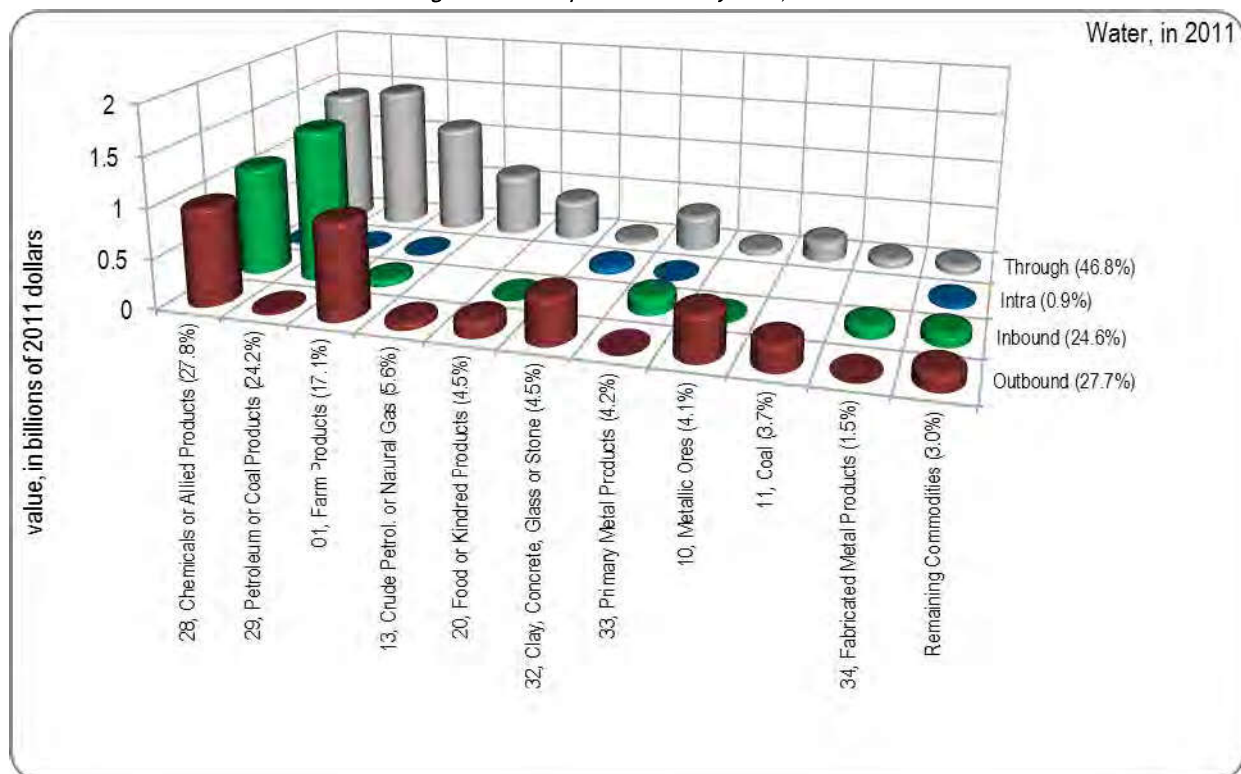
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Figure 29: Port Top Commodities by Tonnage, 2011



Source: prepared by CDM Smith, based on TRANSEARCH® data for 2011

Figure 30: Port Top Commodities by Value, 2011



Source: prepared by CDM Smith, based on TRANSEARCH® data for 2011

Appendix A: Attachments A-D

Port Outbound

Table 23 at the end of this document presents outbound port commodities from Missouri in 2011, which total 20.0 million tons (40.1% of directional movements), valued at \$3.5 billion (27.7%), with an average value/ton of \$174; the top five commodities include:

Tonnage:

- Coal (6.9 million tons, 34.7% of outbound total);
- Farm Products (4.9 million, 24.6%);
- Clay, Concrete, Glass, or Stone (3.4 million, 16.8%);
- Nonmetallic Minerals (2.5 million, 12.7%); and,
- Chemicals or Allied Products (0.9 million, 4.3%)

Value:

- Chemicals or Allied Products (\$976 million, 28.1% of outbound total);
- Farm Products (\$960 million, 27.6%);
- Clay, Concrete, Glass, or Stone (\$458 million, 13.2%);
- Metallic Ores (\$446 million, 12.8%); and,
- Coal (\$253 million, 7.3%)

Port Inbound

Table 24 at the end of this document presents inbound port commodities to Missouri in 2011, which total 5.1 million tons (10.2% of directional movements), valued at \$3.1 billion (24.6%), with an average value/ton of \$605; the top five commodities include:

Tonnage:

- Chemicals or Allied Products (1.7 million tons, 33.6% of inbound total);
- Petroleum or Coal Products (1.7 million, 32.7%);
- Nonmetallic Minerals (0.7 million, 13.3%);
- Metallic Ores (0.5 million, 10.3%); and,
- Farm Products (0.2 million, 4.3%)

Value:

- Petroleum or Coal Products (\$1.5 billion, 49.7% of inbound total);
- Chemicals or Allied Products (\$1.1 billion, 35.4%);
- Primary Metal Products (\$164 million, 5.3%);
- Fabricated Metal Products (\$105 million, 3.4%); and,
- Machinery (\$60 million, 2.0%)

Port Intra

Table 25 at the end of this document presents intrastate port commodities within Missouri in 2011, which total 4.9 million tons (9.9% of directional movements), valued at \$117 million (0.9%), with an average value/ton of \$24; the top five commodities include:

Tonnage:

- Nonmetallic Minerals (4.3 million tons, 86.2% of intrastate total);
- Clay, Concrete, Glass, or Stone (606,917, 12.3%);
- Chemicals or Allied Products (34,128, 0.7%);
- Petroleum or Coal Products (18,800, 0.4%); and,
- Farm Products (17,759, 0.4%)

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Value:

- Clay, Concrete, Glass, or Stone (\$59 million, 50.0% of intrastate total);
- Nonmetallic Minerals (\$33 million, 28.4%);
- Chemicals or Allied Products (\$16 million, 13.9%);
- Farm Products (\$5 million, 4.2%); and,
- Primary Metal Products (\$2 million, 2.0%)

Port Through

Table 26 at the end of this document presents through port commodities moving across Missouri in 2011, which total 19.9 million tons (39.8% of directional movements), valued at \$5.9 billion (46.8%), with an average value/ton of \$296; the top five commodities include:

Tonnage:

- Coal (5.7 million tons, 28.7% of through total);
- Farm Products (5.7 million, 28.7%);
- Petroleum or Coal Products (2.4 million, 12.0%);
- Chemicals or Allied Products (2.0 million, 10.1%); and,
- Nonmetallic Minerals (1.3 million, 6.4%)

Value:

- Petroleum or Coal Products (\$1.5 billion, 25.3% of through total);
- Chemicals or Allied Products (\$1.4 billion, 23.8%);
- Farm Products (\$1.1 billion, 19.0%);
- Crude Petroleum or Natural Gas (\$0.6 billion, 10.8%); and,
- Food or Kindred Products (\$0.4 billion, 6.9%)

Air, 2011

Missouri air movements in 2011 totaled 73,003 tons, valued at \$11.4 billion (**Table 7**). On average, total port commodity movements are valued at \$155,974/ton. Air movements represent less than 0.01% of modal tonnage in Missouri and less than 1.0% of total modal value in 2011, a very small proportion relative to other modes.

As depicted in **Figure 31**, outbound and inbound tonnage directions constitute the gross majority (and proportionally similar) directional movements: 47.0% and 52.4%, respectively, of total air tonnage. However, in terms of value, the outbound-based traffic is the relatively largest share, due to the relatively higher value/ton metric for outbound compared to inbound air movements (more than twice as expensive). Intrastate and through air movements are insignificant and effectively dismissible, given the combined total of only 441 tons, valued at \$110 million (as such, commodity details for such modal directions are not delineated in subsections below).

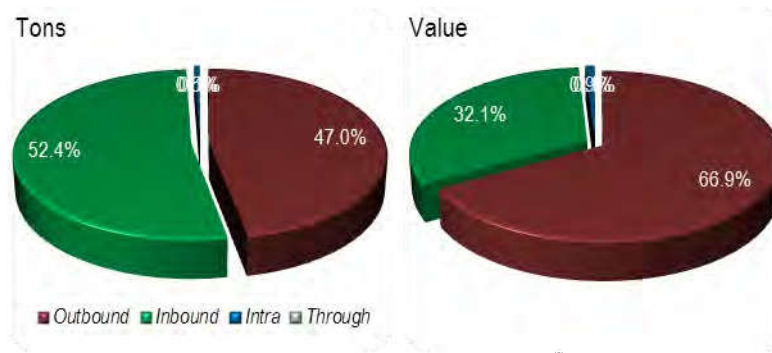
Table 7: Air by Direction, 2011

Direction	Tons		Value (in millions)		Average Value/Ton
	Amount	Percent	Amount	Percent	
Outbound	34,313	47.0%	\$7,620	66.9%	\$222,085
Inbound	38,249	52.4%	\$3,656	32.1%	\$95,591
Intra	370	0.5%	\$100	0.9%	\$270,224
Through	71	0.1%	\$10	0.1%	\$139,152
Total	73,003	100.0%	\$11,387	100.0%	\$155,974

Source: prepared by CDM Smith, based on TRANSEARCH® data for 2011

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Figure 31: Air Percentages by Direction, 2011



Source: prepared by CDM Smith, based on TRANSEARCHSM data for 2011

Figure 32 and Figure 33 depict the top two-digit STCC commodities for Missouri air, by tonnage and value, respectively, with a directional composition. Such graphics depict the largest respective commodity movements for air by direction, and in conjunction with the tabulated data in Table 27 through Table 30, at the end of this document, the top air commodity movements by direction are identified in the respective subsections (for only inbound and outbound).

In terms of all port directions combined, the top five commodities include:

Tonnage:

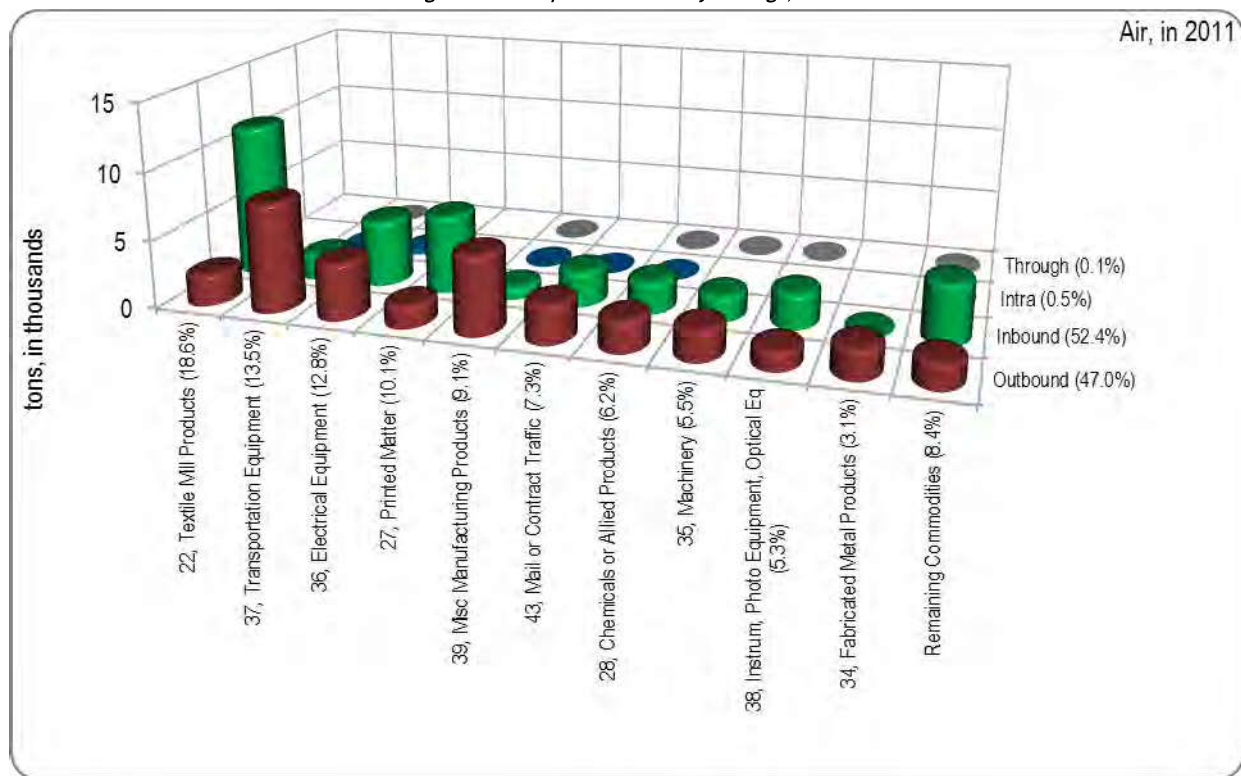
- Textile Mill Products (13,591 tons, 18.6% of modal total);
- Transportation Equipment (9,862, 13.5%);
- Electrical Equipment (9,351, 12.8%);
- Printed Matter (7,388, 10.1%); and,
- Miscellaneous Manufacturing Products (6,669, 9.1%)

Value:

- Miscellaneous Manufacturing Products (\$4.1 billion, 35.8% of modal total);
- Transportation Equipment (\$2.2 billion, 19.6%);
- Electrical Equipment (\$2.1 billion, 18.3%);
- Chemicals or Allied Products (\$1.1 billion, 9.5%); and,
- Instruments, Photo Equipment, and Optical Equipment (\$0.8 billion, 7.0%)

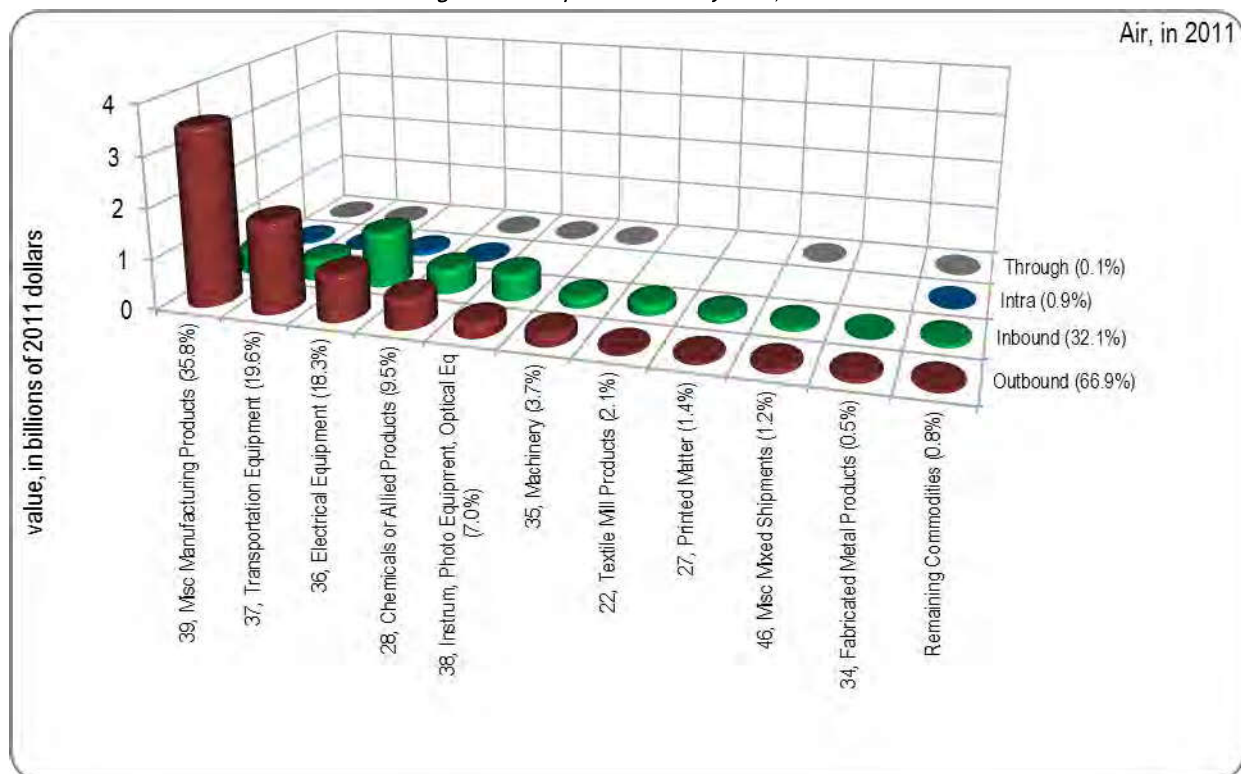
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Figure 32: Air Top Commodities by Tonnage, 2011



Source: prepared by CDM Smith, based on TRANSEARCH® data for 2011

Figure 33: Air Top Commodities by Value, 2011



Source: prepared by CDM Smith, based on TRANSEARCH® data for 2011

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Air Outbound

Table 27 at the end of this document presents outbound air commodities from Missouri in 2011, which total 34,313 tons (47.0% of directional movements), valued at \$7.6 billion (66.9%), with an average value/ton of \$222.085; the top five commodities include:

Tonnage:

- Transportation Equipment (8,016 tons, 23.4% of outbound total);
- Miscellaneous Manufacturing Products (5,770, 16.8%);
- Electrical Equipment (4,152, 12.1%);
- Mail or Contract Traffic (2,786, 8.1%); and,
- Textile Mill Products (2,299, 6.7%)

Value:

- Miscellaneous Manufacturing Products (\$3.5 billion, 46.3% of outbound total);
- Transportation Equipment (\$1.8 billion, 23.9%);
- Electrical Equipment (\$0.9 billion, 12.1%);
- Chemicals or Allied Products (\$0.6 billion, 7.8%); and,
- Instruments, Photo Equipment, and Optical Equipment (\$0.3 billion, 3.6%)

Air Inbound

Table 28 at the end of this document presents inbound air commodities to Missouri in 2011, which total 38,249 tons (52.4% of directional movements), valued at \$3.7 billion (32.1%), with an average value/ton of \$95.591; the top five commodities include:

Tonnage:

- Textile Mill Products (11,292 tons, 29.5% of inbound total);
- Printed Matter (5,763, 15.1%);
- Electrical Equipment (4,906, 12.8%);
- Mail or Contract Traffic (2,552, 6.7%); and,
- Instruments, Photo Equipment, and Optical Equipment (2,531, 6.6%)

Value:

- Electrical Equipment (\$1.1 billion, 30.0% of inbound total);
- Instruments, Photo Equipment, and Optical Equipment (\$0.5 billion, 14.1%);
- Miscellaneous Manufacturing Products (\$0.5 billion, 14.1%);
- Chemicals or Allied Products (\$0.5 billion, 13.2%); and,
- Transportation Equipment (\$0.4 billion, 11.2%)

Pipeline, 2011

Missouri pipeline movements in 2011 totaled 8.3 million tons, valued at \$5.8 billion (**Table 8**). On average, total pipeline commodity movements are valued at \$690/ton. Pipeline movements represent less than 1.0% of modal tonnage in Missouri and 0.5% of total modal value in 2011. This is the second smallest relative volume and smallest value of the presented modes.

As depicted in **Figure 34**, only through and inbound tonnage directions exist for pipeline in Missouri, with through constituting the significant majority for both tonnage and value (88.8% of both terms).

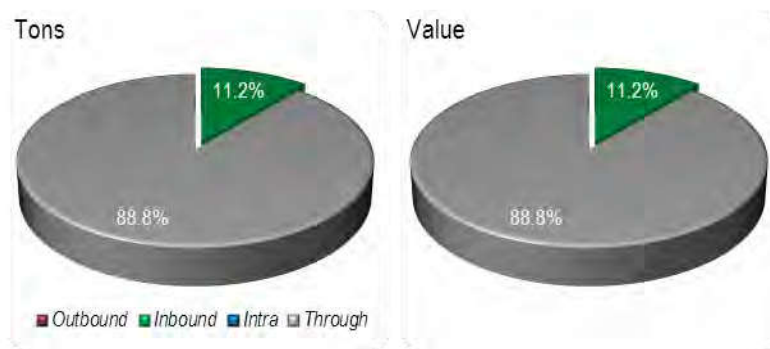
Appendix A: Attachments A-D

Table 8: Pipeline by Direction, 2011

Direction	Tons		Value (in millions)		Average Value/Ton
	Amount	Percent	Amount	Percent	
Outbound	#N/A	#N/A	#N/A	#N/A	#N/A
Inbound	932,258	11.2%	\$643	11.2%	\$690
Intra	#N/A	#N/A	#N/A	#N/A	#N/A
Through	7,412,827	88.8%	\$5,117	88.8%	\$690
Total	8,345,085	100.0%	\$5,761	100.0%	\$690

Source: prepared by CDM Smith, based on TRANSEARCH® data for 2011

Figure 34: Pipeline Percentages by Direction, 2011



Source: prepared by CDM Smith, based on TRANSEARCH® data for 2011

As Missouri pipeline movements comprise only two commodities (Crude Petroleum and Natural Gas, and Petroleum or Coal Products) and two directions (inbound and through), graphical depictions of the top two-digit STCC commodities are unwarranted, as is the aggregated directional top commodity outline. Table 31 through Table 34 identifies the pipeline commodity movements by direction.

In effect, over 99.9% of all pipeline-related movements are classified in the STCC category of Crude Petroleum and Natural Gas, with an insignificant fraction accounting for Petroleum or Coal Products as an inbound movement. As depicted above, most of the Crude Petroleum and Natural Gas (88.8%) simply traverses through Missouri.

Forecast Freight

Tonnage across the Missouri freight network is forecast, by TRANSEARCH®, to grow 37.3% from 2011 to 2030 (1.7% annually), as summarized in Table 9. While air is forecast to exhibit the fastest growth of the modes (3.5% annually), growth is from a relatively small tonnage base in 2011, and has little bearing on the absolute tonnage growth projected on the entire network. In contrast, truck growth is forecast to grow by 55.5% (2.4% annually), from 500.4 million tons in 2011 to 778.1 million in 2030, a 277.7 million ton increase. In the context of the aggregate 378.8 million ton growth forecast for all combined modes, this 277.7 million increase in truck constitutes 73.3%, about half of which is attributable to through movements. Directionally, intrastate movements are forecast to exhibit the largest percentage growth (73.0%, or 2.9% annually); however, through traffic is projected to increase in absolute tonnage terms (204.8 million) in excesses of all the three other directions combined (174.0 million).

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Table 9: Tonnage Forecast by Mode and Direction, 2011 to 2030

Direction	Air	Pipe	Rail	Truck	Water	Total
2011						
Outbound	34,313	#N/A	21,510,433	75,301,621	19,973,291	116,819,658
Inbound	38,249	932,258	92,326,793	89,250,507	5,093,847	187,641,654
Intra	370	#N/A	2,436,087	105,627,915	4,941,503	113,005,875
Through	71	7,412,827	341,805,597	230,212,488	19,850,043	599,281,026
Total	73,003	8,345,085	458,078,910	500,392,531	49,858,684	1,016,748,213
2030						
Outbound	54,382	#N/A	35,366,325	108,430,027	25,917,689	169,768,423
Inbound	84,077	993,713	90,178,404	129,095,659	5,906,771	226,258,624
Intra	726	#N/A	3,237,194	182,656,763	9,565,245	195,459,929
Through	112	7,896,550	416,384,127	357,953,967	21,865,151	804,099,907
Total	139,296	8,890,264	545,166,049	778,136,417	63,254,857	1,395,586,882
Annual Percent Growth						
Outbound	2.5%	#N/A	2.7%	1.9%	1.4%	2.0%
Inbound	4.2%	0.3%	-0.1%	2.0%	0.8%	1.0%
Intra	3.6%	#N/A	1.5%	2.9%	3.5%	2.9%
Through	2.4%	0.3%	1.0%	2.4%	0.5%	1.6%
Total	3.5%	0.3%	0.9%	2.4%	1.3%	1.7%
Total Percent Growth						
Outbound	58.5%	#N/A	64.4%	44.0%	29.8%	45.3%
Inbound	119.8%	6.6%	-2.3%	44.6%	16.0%	20.6%
Intra	96.2%	#N/A	32.9%	72.9%	93.6%	73.0%
Through	56.8%	6.5%	21.8%	55.5%	10.2%	34.2%
Total	90.8%	6.5%	19.0%	55.5%	26.9%	37.3%
Tonnage Growth						
Outbound	20,068	#N/A	13,855,892	33,128,407	5,944,398	52,948,764
Inbound	45,828	61,455	(2,148,389)	39,845,152	812,925	38,616,971
Intra	356	#N/A	801,107	77,028,848	4,623,743	82,454,054
Through	40	483,724	74,578,530	127,741,479	2,015,108	204,818,881
Total	66,293	545,179	87,087,139	277,743,886	13,396,173	378,838,670

Source: prepared by CDM Smith, based on TRANSEARCH® data for 2011 and 2030

Truck Forecast

Table 10 depicts the directional composition of truck movements in Missouri between 2011 and 2030, which is relatively constant over the future analysis horizon. Truck tonnage is forecast to increase from 500.4 million in 2011 to 778.1 million in 2030, a cumulative increase of 55.5% (2.4% annually). Truck commodity value is forecast to increase from \$710.9 billion in 2011 to \$1.20 trillion by 2030, a cumulative increase of 68.4% (2.8% annually).

Freight density growth across the Missouri road network is shown in Figure 35, which indicates the greatest truck volume increases on I-44 and I-55.

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Table 10: Truck Forecast by Direction, 2011 to 2030

Direction	2011		2030		Percent Change	
	Amount	Percent	Amount	Percent	Total	CAGR
Tons						
Outbound	75,301,621	15.0%	108,430,027	13.9%	44.0%	1.9%
Inbound	89,250,507	17.8%	129,095,659	16.6%	44.6%	2.0%
Intra	105,627,915	21.1%	182,656,763	23.5%	72.9%	2.9%
Through	230,212,488	46.0%	357,953,967	46.0%	55.5%	2.4%
Total	500,392,531	100.0%	778,136,417	100.0%	55.5%	2.4%
Value, in millions						
Outbound	\$95,005	13.4%	\$139,161	11.6%	46.5%	2.0%
Inbound	\$119,731	16.8%	\$194,892	16.3%	62.8%	2.6%
Intra	\$62,346	8.8%	\$78,333	6.5%	25.6%	1.2%
Through	\$433,794	61.0%	\$784,501	65.5%	80.8%	3.2%
Total	\$710,876	100.0%	\$1,196,888	100.0%	68.4%	2.8%

Source: prepared by CDM Smith, based on TRANSEARCH® data for 2011 and 2030

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Figure 35: Truck Density Growth, 2011 to 2030



Source: prepared by CDM Smith, based on TRANSEARCH® data for 2011 and 2030

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Table 35 at the end of this document presents commodity movements (all directions) by truck in 2030, which total 778.1 million tons, carried via 63.2 million units, valued at \$1.20 trillion, with an average value/ton of \$1,538 (compared with 2011 truck movements for all directions); the top five commodities include:

Tonnage:

- Nonmetallic Minerals (202.7 million tons, 26.1% of modal total);
- Secondary Traffic (154.8 million, 19.9%);
- Farm Products (91.2 million, 11.7%);
- Food or Kindred Products (77.5 million, 10.0%); and,
- Chemicals or Allied Products (55.6 million, 7.2%)

Units:

- Shipping Containers (24.5 million units, 38.8% of modal total);
- Nonmetallic Minerals (8.3 million, 13.2%);
- Secondary Traffic (8.1 million, 12.8%);
- Farm Products (5.5 million, 8.7%); and,
- Food or Kindred Products (3.4 million, 5.4%)

Value:

- Secondary Traffic (\$285.9 billion, 23.9% of modal total);
- Electrical Equipment (\$142.6 billion, 11.9%);
- Machinery (\$110.6 billion, 9.2%);
- Chemicals or Allied Products (\$104.1 billion, 8.7%); and,
- Transportation Equipment (\$98.6 billion, 8.2%)

Table 40 at the end of this document summarizes truck-based commodity tonnage growth from 2011 to 2030; the top five commodities with the largest growth include:

Tonnage Percent Growth:

- Instruments, Photo Equipment, and Optical Equipment (243.2%, 6.7% annually);
- Miscellaneous Manufacturing Products (156.7%, 5.1% annually);
- Electrical Equipment (121.5%, 4.3% annually);
- Miscellaneous Mixed Shipments (109.8%, 4.0% annually); and,
- Nonmetallic Minerals (98.1%, 3.7% annually)

Tonnage Volume Growth:

- Nonmetallic Minerals (100.4 million tons, 98.1% Δ over 2011);
- Secondary Traffic (70.9 million, 84.4% Δ);
- Food or Kindred Products (20.0 million, 34.9% Δ);
- Clay, Concrete, Glass, or Stone (18.9 million, 94.1% Δ); and,
- Chemicals or Allied Products (13.8 million, 33.1% Δ)

Rail Forecast

Table 11 depicts the directional composition of rail movements in Missouri between 2011 and 2030, which is relatively constant over the future analysis horizon. Rail tonnage is forecast to increase from 458.1 million in 2011 to 545.2 million in 2030, a cumulative increase of 19.0% (0.9% annually). Rail commodity value is forecast to increase from \$465.0 billion in 2011 to \$790.6 billion by 2030, a cumulative increase of 70.0% (2.8% annually). Note that inbound tonnage is forecast to decline.

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Freight density growth across the Missouri rail network is shown in **Figure 36**, which indicates the greatest rail volume increases on the BNSF line connecting Kansas City and Chicago.

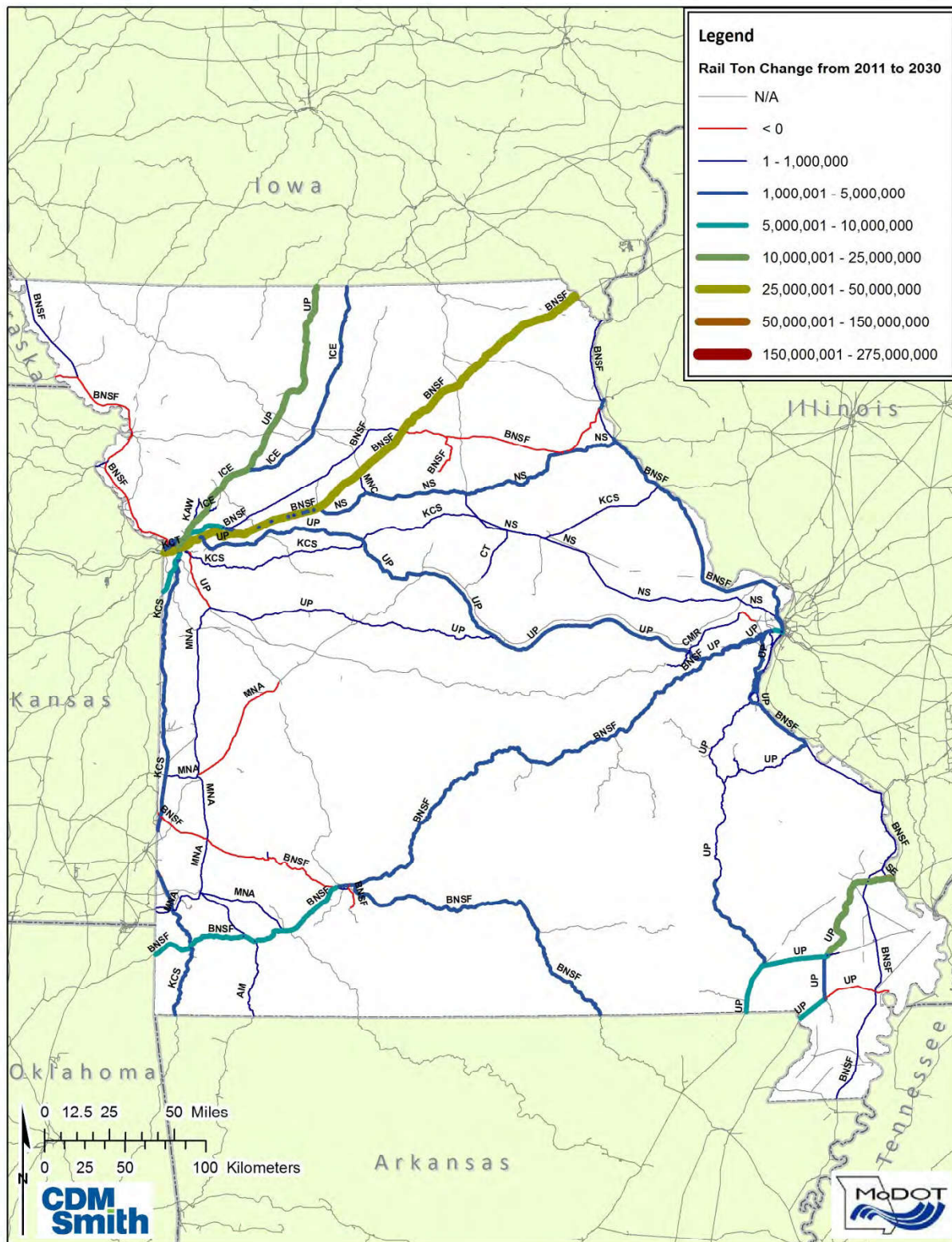
Table 11: Rail Forecast by Direction, 2011 to 2030

Direction	2011		2030		Percent Change	
	Amount	Percent	Amount	Percent	Total	CAGR
Tons						
Outbound	21,510,433	4.7%	35,366,325	6.5%	64.4%	2.7%
Inbound	92,326,793	20.2%	90,178,404	16.5%	-2.3%	-0.1%
Intra	2,436,087	0.5%	3,237,194	0.6%	32.9%	1.5%
Through	341,805,597	74.6%	416,384,127	76.4%	21.8%	1.0%
Total	458,078,910	100.0%	545,166,049	100.0%	19.0%	0.9%
Value, in millions						
Outbound	\$40,364	8.7%	\$67,228	8.5%	66.6%	2.7%
Inbound	\$39,647	8.5%	\$64,535	8.2%	62.8%	2.6%
Intra	\$1,616	0.3%	\$3,393	0.4%	110.0%	4.0%
Through	\$383,409	82.4%	\$655,439	82.9%	71.0%	2.9%
Total	\$465,035	100.0%	\$790,595	100.0%	70.0%	2.8%

Source: prepared by CDM Smith, based on TRANSEARCH[®] data for 2011 and 2030

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Figure 36: Rail Density Growth, 2011 to 2030



Source: prepared by CDM Smith, based on TRANSEARCH® data for 2011 and 2030

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Table 36 at the end of this document presents commodity movements (all directions) by rail in 2030, which total 545.2 million tons, carried via 12.0 million units, valued at \$790.6 billion, with an average value/ton of \$1,450 (compared with 2011 rail movements for all directions); the top five commodities include:

Tonnage:

- Coal (192.2 million tons, 35.3% of modal total);
- Miscellaneous Mixed Shipments (64.6 million, 11.9%);
- Food or Kindred Products (54.0 million, 9.9%);
- Chemicals or Allied Products (50.0 million, 9.2%); and,
- Farm Products (49.3 million, 9.0%)

Units:

- Miscellaneous Mixed Shipments (4.6 million units, 38.0% of modal total);
- Coal (1.6 million, 13.4%);
- Transportation Equipment (1.4 million, 11.5%);
- Food or Kindred Products (0.8 million, 6.7%); and,
- Farm Products (0.6 million, 5.3%)

Value:

- Miscellaneous Mixed Shipments (\$325.1 billion, 41.1% of modal total);
- Transportation Equipment (\$235.4 billion, 29.8%);
- Chemicals or Allied Products (\$79.6 billion, 10.1%);
- Food or Kindred Products (\$39.1 billion, 4.9%); and,
- Primary Metal Products (\$25.8 billion, 3.3%)

Table 41 at the end of this document summarizes rail-based commodity tonnage growth from 2011 to 2030; the top five commodities with the largest growth include:

Tonnage Percent Growth:

- Clay, Concrete, Glass, or Stone (132.4%, 4.5% annually);
- Instruments, Photo Equipment, and Optical Equipment (129.2%, 4.5% annually);
- Machinery (119.3%, 4.2% annually);
- Waste or Scrap Materials (111.3%, 4.0% annually); and,
- Transportation Equipment (107.2%, 3.9% annually)

Tonnage Volume Growth:

- Miscellaneous Mixed Shipments (27.4 million tons, 73.7% Δ over 2011);
- Food or Kindred Products (14.7 million, 37.4% Δ);
- Transportation Equipment (14.0 million, 107.2% Δ);
- Farm Products (13.1 million, 36.2% Δ); and,
- Chemicals or Allied Products (11.7 million, 30.7% Δ)

Port Forecast

Table 12 depicts the directional composition of port movements in Missouri between 2011 and 2030, which is relatively constant over the future analysis horizon; but, intrastate movements increase somewhat (albeit, continuing to be relatively insignificant compared to other directional port movements). Port tonnage is forecast to increase from 49.9 million in 2011 to 63.3 million in 2030, a cumulative increase of 26.9% (1.3% annually). Port commodity value is forecast to increase from \$12.5 billion in 2011 to \$15.4 billion by 2030, a cumulative increase of 23.1% (1.1% annually).

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Table 12: Port Forecast by Direction, 2011 to 2030

Direction	2011		2030		Percent Change	
	Amount	Percent	Amount	Percent	Total	CAGR
Tons						
Outbound	19,973,291	40.1%	25,917,689	41.0%	29.8%	1.4%
Inbound	5,093,847	10.2%	5,906,771	9.3%	16.0%	0.8%
Intra	4,941,503	9.9%	9,565,245	15.1%	93.6%	3.5%
Through	19,850,043	39.8%	21,865,151	34.6%	10.2%	0.5%
Total	49,858,684	100.0%	63,254,857	100.0%	26.9%	1.3%
Value, in millions						
Outbound	\$3,479	27.7%	\$4,302	27.8%	23.6%	1.1%
Inbound	\$3,083	24.6%	\$4,060	26.3%	31.7%	1.5%
Intra	\$117	0.9%	\$253	1.6%	116.2%	4.1%
Through	\$5,870	46.8%	\$6,833	44.2%	16.4%	0.8%
Total	\$12,549	100.0%	\$15,448	100.0%	23.1%	1.1%

Source: prepared by CDM Smith, based on TRANSEARCH® data for 2011 and 2030

Table 37 at the end of this document presents commodity movements (all directions) by port, in 2030, which total 63.3 million tons, valued at \$15.4 billion, with an average value/ton of \$244 (compared with 2011 port movements for all directions); the top five commodities include:

Tonnage:

- Nonmetallic Minerals (14.7 million tons, 23.2% of modal total);
- Farm Products (11.1 million, 17.5%);
- Coal (10.9 million, 17.2%);
- Clay, Concrete, Glass, or Stone (10.5 million, 16.6%); and,
- Chemicals or Allied Products (4.9 million, 7.8%)

Value:

- Chemicals or Allied Products (\$3.7 billion, 24.3% of modal total);
- Petroleum or Coal Products (\$2.8 billion, 17.9%);
- Farm Products (\$2.2 billion, 14.5%);
- Crude Petroleum or Natural Gas (\$1.8 billion, 11.4%); and,
- Clay, Concrete, Glass, or Stone (\$1.3 billion, 8.6%)

Table 42 at the end of this document summarizes port-based commodity tonnage growth from 2011 to 2030; top five commodities with the largest growth include:

Tonnage Percent Growth:

- Lumber or Wood Products (222.5%, 6.4% annually);
- Fabricated Metal Products (152.2%, 5.0% annually);
- Crude Petroleum or Natural Gas (150.1%, 4.9% annually);
- Clay, Concrete, Glass, or Stone (145.5%, 4.8% annually); and,
- Primary Metal Products (112.9%, 4.1% annually)

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Tonnage Volume Growth:

- Clay, Concrete, Glass, or Stone (6.2 million tons, 145.5% Δ over 2011);
- Nonmetallic Minerals (5.9 million, 67.5% Δ);
- Crude Petroleum or Natural Gas (1.5 million, 150.1% Δ);
- Lumber or Wood Products (0.7 million, 222.5% Δ); and,
- Chemicals or Allied Products (0.3 million, 6.6% Δ)

Air Forecast

Table 13 depicts the directional composition of air movements in Missouri between 2011 and 2030, which changes somewhat over the future analysis horizon; outbound movements decrease in relative proportion, while inbound movements increase. Air tonnage is forecast to increase from 73,003 in 2011 to 139,296 in 2030, a cumulative increase of 90.8% (3.5% annually). Air commodity value is forecast to increase from \$11.4 billion in 2011 to \$27.5 billion by 2030, a cumulative increase of 141.8% (4.8% annually).

Table 13: Air Forecast by Direction, 2011 to 2030

Direction	2011		2030		Percent Change	
	Amount	Percent	Amount	Percent	Total	CAGR
Tons						
Outbound	34,313	47.0%	54,382	39.0%	58.5%	2.5%
Inbound	38,249	52.4%	84,077	60.4%	119.8%	4.2%
Intra	370	0.5%	726	0.5%	96.2%	3.6%
Through	71	0.1%	112	0.1%	56.8%	2.4%
Total	73,003	100.0%	139,296	100.0%	90.8%	3.5%
Value, in millions						
Outbound	\$7,620	66.9%	\$16,592	60.3%	117.7%	4.2%
Inbound	\$3,656	32.1%	\$10,681	38.8%	192.1%	5.8%
Intra	\$100	0.9%	\$245	0.9%	144.5%	4.8%
Through	\$10	0.1%	\$16	0.1%	65.2%	2.7%
Total	\$11,387	100.0%	\$27,534	100.0%	141.8%	4.8%

Source: prepared by CDM Smith, based on TRANSEARCH® data for 2011 and 2030

Table 38 at the end of this document presents commodity movements (all directions) by air in 2030, which total 139,296 tons, valued at \$27.5 billion, with an average value/ton of \$197,667 (compared with 2011 air movements for all directions); the top five commodities include:

Tonnage:

- Textile Mill Products (30,213 tons, 21.7% of modal total);
- Electrical Equipment (29,156, 20.9%);
- Miscellaneous Manufacturing Products (19,563, 14.0%);
- Transportation Equipment (13,842, 9.9%); and,
- Instruments, Photo Equipment, and Optical Equipment (9,912, 7.1%)

Value:

- Miscellaneous Manufacturing Products (\$12.0 billion, 43.4% of modal total);
- Electrical Equipment (\$6.5 billion, 23.6%);
- Transportation Equipment (\$3.1 billion, 11.4%);
- Chemicals or Allied Products (\$2.2 billion, 8.1%); and,

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- Instruments, Photo Equipment, and Optical Equipment (\$2.0 billion, 7.4%)

Table 43 at the end of this document summarizes air-based commodity tonnage growth from 2011 to 2030; the top five commodities with the largest growth include:

Tonnage Percent Growth:

- Apparel or Related Products (222.3%, 6.4% annually);
- Electrical Equipment (211.8%, 6.2% annually);
- Miscellaneous Manufacturing Products (193.3%, 5.8% annually);
- Instruments, Photo and Optical Equipment (155.5%, 5.1% annually); and,
- Lumber or Wood Products (155.1%, 5.1% annually)

Tonnage Volume Growth:

- Electrical Equipment (19,805 tons, 211.8% Δ over 2011);
- Textile Mill Products (16,622, 122.3% Δ);
- Miscellaneous Manufacturing Products (12,894, 193.3% Δ);
- Instruments, Photo and Optical Equipment (6,033, 155.5% Δ); and,
- Chemicals or Allied Products (4,421, 97.4% Δ)

Pipeline Forecast

Table 14 depicts the directional composition of pipeline movements in Missouri between 2011 and 2030, which remains completely constant over the future analysis horizon. Pipeline tonnage is forecast to increase from 8.3 million tons in 2011 to 9.0 million in 2030, a cumulative increase of 6.5% (0.3% annually). Pipeline commodity value is forecast to increase from \$5.8 billion in 2011 to \$6.1 billion by 2030, a cumulative increase of 6.5% (0.3% annually).

Table 14: Pipeline Forecast by Direction, 2011 to 2030

Direction	2011		2030		Percent Change	
	Amount	Percent	Amount	Percent	Total	CAGR
Tons						
Outbound	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
Inbound	932,258	11.2%	993,713	11.2%	6.6%	0.3%
Intra	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
Through	7,412,827	88.8%	7,896,550	88.8%	6.5%	0.3%
Total	8,345,085	100.0%	8,890,264	100.0%	6.5%	0.3%
Value, in millions						
Outbound	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
Inbound	\$643	11.2%	\$686	11.2%	6.6%	0.3%
Intra	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
Through	\$5,117	88.8%	\$5,451	88.8%	6.5%	0.3%
Total	\$5,761	100.0%	\$6,137	100.0%	6.5%	0.3%

Source: prepared by CDM Smith, based on TRANSEARCH[®] data for 2011 and 2030

In Missouri, growth in pipeline movements is effectively attributable to increases to only one commodity: Crude Petroleum and Natural Gas; and, given the directional composition that remains unaltered over the forecast horizon, a majority of that tonnage and value increase is through-based. **Table 39** at the end of this document presents such commodity movements (all directions) for 2030; and **Table 44** at the end of this document summarizes tonnage growth from 2011 to 2030.

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Conclusions and Next Steps

Missouri is a bridge state; the TRANSEARCH[®] data confirms this assertion with evidence indicating that the significant majority of movements traversing the transportation infrastructure network of Missouri is truck- and rail-based through traffic. This is predominantly rail-based coal and truck-based secondary traffic. It is also projected that the dominance of through-based traffic will amplify by 2030, reinforcing the role of Missouri as a bridge state. Of the modes, truck carries the largest relative volume and value, followed by rail; port, air, and pipeline combined comprise a minority of freight movements.

It is thus important to understand the implications of these movements on the freight infrastructure network in Missouri, as the users of the system are accordingly non-Missouri based. In effect, the freight system in Missouri is serving the necessary needs of others. In effect, shippers, receivers, and carriers beyond the geography of Missouri benefit from the infrastructure (i.e., national benefits), while Missouri shoulders the costs of infrastructure development and maintenance.

Of course, these considerations are just one of many perspectives regarding relative importance of freight. Others would include economic importance and public perception. Consequently, the ensuing economic analysis builds upon the freight data presented herein to explain and quantify the importance of freight transport to the Missouri economy. Economic impacts associated with freight go far beyond the impacts associated with freight transport service. A vast majority of freight-related economic impact is associated with the firms that use freight transport to conduct business. To understand such impact, one needs to know the value of freight movements by direction, and how the economy uses such commodities to produce goods and services.

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Table 15: Truck Outbound, 2011

STCC2	Commodity	Tons		Units		Value (in millions)		Average Value/Ton
		Amount	Percent	Amount	Percent	Amount	Percent	
01	Farm Prods.	17,929,282	23.8%	1,101,737	13.6%	\$9,186	9.7%	\$512
08	Forest Prods.	23	0.0%	1	0.0%	\$0	0.0%	\$12,901
09	Fresh Fish or Marine Prods.	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
10	Metallic Ores	31	0.0%	1	0.0%	\$0	0.0%	\$1,053
11	Coal	229,275	0.3%	9,243	0.1%	\$8	0.0%	\$37
13	Crude Petrol. or Natural Gas	38	0.0%	2	0.0%	\$0	0.0%	\$593
14	Nonmetallic Minerals	14,399,113	19.1%	592,304	7.3%	\$157	0.2%	\$11
19	Ordinance or Accessories	42,048	0.1%	1,877	0.0%	\$784	0.8%	\$18,656
20	Food or Kindred Prods.	10,536,567	14.0%	458,951	5.7%	\$14,161	14.9%	\$1,344
21	Tobacco Prods.	485	0.0%	22	0.0%	\$8	0.0%	\$16,819
22	Textile Mill Prods.	28,437	0.0%	1,330	0.0%	\$140	0.1%	\$4,931
23	Apparel or Related Prods.	46,908	0.1%	2,889	0.0%	\$301	0.3%	\$6,425
24	Lumber or Wood Prods.	2,139,797	2.8%	85,195	1.1%	\$985	1.0%	\$460
25	Furniture or Fixtures	123,905	0.2%	8,220	0.1%	\$574	0.6%	\$4,636
26	Pulp, Paper or Allied Prods.	1,214,320	1.6%	50,463	0.6%	\$2,193	2.3%	\$1,806
27	Printed Matter	790,759	1.1%	44,394	0.5%	\$2,509	2.6%	\$3,173
28	Chemicals or Allied Prods.	3,313,843	4.4%	156,032	1.9%	\$9,155	9.6%	\$2,763
29	Petroleum or Coal Prods.	2,704,066	3.6%	113,970	1.4%	\$866	0.9%	\$320
30	Rubber or Misc Plastics	947,430	1.3%	80,295	1.0%	\$3,556	3.7%	\$3,753
31	Leather or Leather Prods.	14,382	0.0%	977	0.0%	\$155	0.2%	\$10,785
32	Clay, Concrete, Glass, or Stone	2,870,236	3.8%	179,684	2.2%	\$571	0.6%	\$199
33	Primary Metal Prods.	1,276,525	1.7%	51,048	0.6%	\$3,509	3.7%	\$2,749
34	Fabricated Metal Prods.	1,310,919	1.7%	73,470	0.9%	\$4,050	4.3%	\$3,089
35	Machinery	827,465	1.1%	61,424	0.8%	\$7,509	7.9%	\$9,075
36	Electrical Equipment	522,538	0.7%	31,326	0.4%	\$3,885	4.1%	\$7,434
37	Transportation Equipment	641,053	0.9%	46,378	0.6%	\$3,971	4.2%	\$6,194
38	Instrum., Photo Eq., Optical Eq.	77,607	0.1%	6,138	0.1%	\$1,081	1.1%	\$13,932
39	Misc Manufacturing Prods.	143,104	0.2%	7,397	0.1%	\$760	0.8%	\$5,311
40	Waste or Scrap Materials	1,536,104	2.0%	70,298	0.9%	\$400	0.4%	\$261
41	Misc Freight Shipments	215,160	0.3%	10,466	0.1%	\$736	0.8%	\$3,419
42	Shipping Containers	127,475	0.2%	4,214,042	52.1%	\$568	0.6%	\$4,453
43	Mail or Contract Traffic	21,479	0.0%	1,045	0.0%	\$57	0.1%	\$2,655
44	Freight Forwarder Traffic	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
45	Shipper Association Traffic	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
46	Misc Mixed Shipments	18,001	0.0%	876	0.0%	\$91	0.1%	\$5,063
47	Small Packaged Shipments	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
48	Waste	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
49	Hazardous Materials	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
50	Secondary Traffic	11,253,247	14.9%	626,586	7.7%	\$23,080	24.3%	\$2,051
60	Unclassified	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
	Total	75,301,621	100.0%	8,088,079	100.0%	\$95,005	100.0%	\$1,262

Source: prepared by CDM Smith, based on TRANSEARCH® data for 2011

Appendix A: Attachments A-D

Table 16: Truck Inbound, 2011

STCC2	Commodity	Tons		Units		Value (in millions)		Average Value/Ton
		Amount	Percent	Amount	Percent	Amount	Percent	
01	Farm Prods.	20,132,480	22.6%	1,238,090	16.0%	\$11,686	9.8%	\$580
08	Forest Prods.	25,527	0.0%	1,098	0.0%	\$60	0.0%	\$2,333
09	Fresh Fish or Marine Prods.	14,338	0.0%	618	0.0%	\$93	0.1%	\$6,468
10	Metallic Ores	19,829	0.0%	781	0.0%	\$86	0.1%	\$4,351
11	Coal	471,062	0.5%	18,991	0.2%	\$17	0.0%	\$37
13	Crude Petrol. or Natural Gas	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
14	Nonmetallic Minerals	13,751,144	15.4%	565,650	7.3%	\$153	0.1%	\$11
19	Ordinance or Accessories	11,065	0.0%	494	0.0%	\$260	0.2%	\$23,490
20	Food or Kindred Prods.	8,298,876	9.3%	362,751	4.7%	\$10,047	8.4%	\$1,211
21	Tobacco Prods.	46,147	0.1%	2,091	0.0%	\$725	0.6%	\$15,713
22	Textile Mill Prods.	111,157	0.1%	5,203	0.1%	\$576	0.5%	\$5,184
23	Apparel or Related Prods.	118,247	0.1%	7,213	0.1%	\$1,084	0.9%	\$9,171
24	Lumber or Wood Prods.	2,593,834	2.9%	102,836	1.3%	\$786	0.7%	\$303
25	Furniture or Fixtures	252,202	0.3%	16,753	0.2%	\$1,102	0.9%	\$4,370
26	Pulp, Paper or Allied Prods.	1,270,729	1.4%	52,587	0.7%	\$1,988	1.7%	\$1,564
27	Printed Matter	687,135	0.8%	38,593	0.5%	\$2,198	1.8%	\$3,199
28	Chemicals or Allied Prods.	3,327,431	3.7%	163,392	2.1%	\$6,538	5.5%	\$1,965
29	Petroleum or Coal Prods.	10,592,400	11.9%	437,473	5.7%	\$10,932	9.1%	\$1,032
30	Rubber or Misc Plastics	961,005	1.1%	81,282	1.1%	\$3,898	3.3%	\$4,056
31	Leather or Leather Prods.	25,522	0.0%	1,720	0.0%	\$427	0.4%	\$16,722
32	Clay, Concrete, Glass, or Stone	4,882,481	5.5%	302,156	3.9%	\$988	0.8%	\$202
33	Primary Metal Prods.	1,658,527	1.9%	66,570	0.9%	\$5,925	4.9%	\$3,572
34	Fabricated Metal Prods.	1,225,682	1.4%	68,216	0.9%	\$4,332	3.6%	\$3,535
35	Machinery	702,700	0.8%	52,027	0.7%	\$6,372	5.3%	\$9,067
36	Electrical Equipment	757,697	0.8%	45,617	0.6%	\$7,323	6.1%	\$9,664
37	Transportation Equipment	1,012,893	1.1%	72,698	0.9%	\$9,890	8.3%	\$9,764
38	Instrum., Photo Eq., Optical Eq.	138,812	0.2%	10,994	0.1%	\$1,777	1.5%	\$12,804
39	Misc Manufacturing Prods.	207,131	0.2%	10,707	0.1%	\$1,144	1.0%	\$5,522
40	Waste or Scrap Materials	930,451	1.0%	42,739	0.6%	\$255	0.2%	\$274
41	Misc Freight Shipments	4,094	0.0%	199	0.0%	\$9	0.0%	\$2,222
42	Shipping Containers	7,946	0.0%	3,180,778	41.2%	\$35	0.0%	\$4,453
43	Mail or Contract Traffic	360,232	0.4%	17,523	0.2%	\$956	0.8%	\$2,655
44	Freight Forwarder Traffic	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
45	Shipper Association Traffic	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
46	Misc Mixed Shipments	34,537	0.0%	1,680	0.0%	\$132	0.1%	\$3,816
47	Small Packaged Shipments	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
48	Waste	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
49	Hazardous Materials	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
50	Secondary Traffic	14,617,194	16.4%	755,574	9.8%	\$27,937	23.3%	\$1,911
60	Unclassified	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
	Total	89,250,507	100.0%	7,725,094	100.0%	\$119,731	100.0%	\$1,342

Source: prepared by CDM Smith, based on TRANSEARCH® data for 2011

Appendix A: Attachments A-D

Table 17: Truck Intra, 2011

STCC2	Commodity	Tons		Units		Value (in millions)		Average Value/Ton
		Amount	Percent	Amount	Percent	Amount	Percent	
01	Farm Prods.	11,456,556	10.8%	595,867	5.9%	\$7,634	12.2%	\$666
08	Forest Prods.	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
09	Fresh Fish or Marine Prods.	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
10	Metallic Ores	91,911	0.1%	3,621	0.0%	\$228	0.4%	\$2,480
11	Coal	51,516	0.0%	2,077	0.0%	\$2	0.0%	\$37
13	Crude Petrol. or Natural Gas	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
14	Nonmetallic Minerals	65,523,273	62.0%	2,695,285	26.9%	\$580	0.9%	\$9
19	Ordinance or Accessories	187	0.0%	8	0.0%	\$4	0.0%	\$23,227
20	Food or Kindred Prods.	2,103,794	2.0%	91,483	0.9%	\$3,086	5.0%	\$1,467
21	Tobacco Prods.	219	0.0%	10	0.0%	\$4	0.0%	\$16,847
22	Textile Mill Prods.	2,094	0.0%	98	0.0%	\$8	0.0%	\$3,962
23	Apparel or Related Prods.	1,768	0.0%	108	0.0%	\$10	0.0%	\$5,628
24	Lumber or Wood Prods.	904,289	0.9%	35,339	0.4%	\$554	0.9%	\$613
25	Furniture or Fixtures	296	0.0%	20	0.0%	\$1	0.0%	\$4,568
26	Pulp, Paper or Allied Prods.	182,253	0.2%	7,595	0.1%	\$335	0.5%	\$1,840
27	Printed Matter	195,047	0.2%	10,924	0.1%	\$594	1.0%	\$3,047
28	Chemicals or Allied Prods.	610,112	0.6%	28,474	0.3%	\$2,147	3.4%	\$3,519
29	Petroleum or Coal Prods.	2,211,500	2.1%	93,022	0.9%	\$1,006	1.6%	\$455
30	Rubber or Misc Plastics	56,077	0.1%	4,752	0.0%	\$216	0.3%	\$3,844
31	Leather or Leather Prods.	64	0.0%	4	0.0%	\$1	0.0%	\$18,385
32	Clay, Concrete, Glass, or Stone	4,444,769	4.2%	283,102	2.8%	\$646	1.0%	\$145
33	Primary Metal Prods.	299,176	0.3%	11,976	0.1%	\$766	1.2%	\$2,561
34	Fabricated Metal Prods.	151,770	0.1%	8,487	0.1%	\$452	0.7%	\$2,980
35	Machinery	24,227	0.0%	1,777	0.0%	\$241	0.4%	\$9,941
36	Electrical Equipment	2,271	0.0%	135	0.0%	\$12	0.0%	\$5,103
37	Transportation Equipment	35,928	0.0%	2,578	0.0%	\$325	0.5%	\$9,036
38	Instrum., Photo Eq., Optical Eq.	19	0.0%	2	0.0%	\$0	0.0%	\$5,971
39	Misc Manufacturing Prods.	169	0.0%	9	0.0%	\$1	0.0%	\$7,637
40	Waste or Scrap Materials	2,343,925	2.2%	106,938	1.1%	\$572	0.9%	\$244
41	Misc Freight Shipments	36,581	0.0%	1,779	0.0%	\$124	0.2%	\$3,401
42	Shipping Containers	78,255	0.1%	5,167,440	51.5%	\$348	0.6%	\$4,453
43	Mail or Contract Traffic	75,961	0.1%	3,695	0.0%	\$202	0.3%	\$2,655
44	Freight Forwarder Traffic	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
45	Shipper Association Traffic	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
46	Misc Mixed Shipments	18,433	0.0%	897	0.0%	\$93	0.1%	\$5,063
47	Small Packaged Shipments	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
48	Waste	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
49	Hazardous Materials	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
50	Secondary Traffic	14,725,472	13.9%	871,599	8.7%	\$42,151	67.6%	\$2,862
60	Unclassified	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
	Total	105,627,915	100.0%	10,029,099	100.0%	\$62,346	100.0%	\$590

Source: prepared by CDM Smith, based on TRANSEARCH® data for 2011

Appendix A: Attachments A-D

Table 18: Truck Through, 2011

STCC2	Commodity	Tons		Units		Value (in millions)		Average Value/Ton
		Amount	Percent	Amount	Percent	Amount	Percent	
01	Farm Prods.	32,655,197	14.2%	1,989,207	13.4%	\$19,230	4.4%	\$589
08	Forest Prods.	160,603	0.1%	6,910	0.0%	\$324	0.1%	\$2,017
09	Fresh Fish or Marine Prods.	175,531	0.1%	7,570	0.1%	\$1,254	0.3%	\$7,144
10	Metallic Ores	208,179	0.1%	8,203	0.1%	\$5,210	1.2%	\$25,026
11	Coal	285,904	0.1%	11,526	0.1%	\$11	0.0%	\$37
13	Crude Petrol. or Natural Gas	742,518	0.3%	30,720	0.2%	\$106	0.0%	\$142
14	Nonmetallic Minerals	8,676,853	3.8%	356,920	2.4%	\$257	0.1%	\$30
19	Ordinance or Accessories	43,768	0.0%	1,954	0.0%	\$964	0.2%	\$22,034
20	Food or Kindred Prods.	36,547,391	15.9%	1,595,450	10.8%	\$43,705	10.1%	\$1,196
21	Tobacco Prods.	210,285	0.1%	9,501	0.1%	\$3,478	0.8%	\$16,541
22	Textile Mill Prods.	349,078	0.2%	16,342	0.1%	\$1,778	0.4%	\$5,092
23	Apparel or Related Prods.	572,680	0.2%	34,931	0.2%	\$6,743	1.6%	\$11,775
24	Lumber or Wood Prods.	7,720,422	3.4%	304,540	2.1%	\$2,589	0.6%	\$335
25	Furniture or Fixtures	1,155,008	0.5%	76,771	0.5%	\$6,524	1.5%	\$5,649
26	Pulp, Paper or Allied Prods.	3,947,555	1.7%	162,923	1.1%	\$6,237	1.4%	\$1,580
27	Printed Matter	703,205	0.3%	39,389	0.3%	\$2,437	0.6%	\$3,466
28	Chemicals or Allied Prods.	34,564,538	15.0%	1,699,670	11.5%	\$55,130	12.7%	\$1,595
29	Petroleum or Coal Prods.	20,365,302	8.8%	845,961	5.7%	\$18,263	4.2%	\$897
30	Rubber or Misc Plastics	5,022,248	2.2%	424,500	2.9%	\$21,119	4.9%	\$4,205
31	Leather or Leather Prods.	283,388	0.1%	19,229	0.1%	\$4,791	1.1%	\$16,907
32	Clay, Concrete, Glass, or Stone	7,941,521	3.4%	478,699	3.2%	\$3,484	0.8%	\$439
33	Primary Metal Prods.	5,136,587	2.2%	205,991	1.4%	\$21,516	5.0%	\$4,189
34	Fabricated Metal Prods.	1,926,610	0.8%	107,191	0.7%	\$8,645	2.0%	\$4,487
35	Machinery	3,526,978	1.5%	259,440	1.8%	\$39,099	9.0%	\$11,086
36	Electrical Equipment	3,376,629	1.5%	202,813	1.4%	\$37,910	8.7%	\$11,227
37	Transportation Equipment	4,664,713	2.0%	336,347	2.3%	\$36,120	8.3%	\$7,743
38	Instrum., Photo Eq., Optical Eq.	321,457	0.1%	25,544	0.2%	\$5,342	1.2%	\$16,619
39	Misc Manufacturing Prods.	830,189	0.4%	42,836	0.3%	\$5,284	1.2%	\$6,365
40	Waste or Scrap Materials	2,970,953	1.3%	135,051	0.9%	\$910	0.2%	\$306
41	Misc Freight Shipments	437,929	0.2%	21,302	0.1%	\$1,502	0.3%	\$3,430
42	Shipping Containers	396,473	0.2%	3,112,611	21.0%	\$1,765	0.4%	\$4,453
43	Mail or Contract Traffic	599,667	0.3%	29,169	0.2%	\$1,592	0.4%	\$2,655
44	Freight Forwarder Traffic	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
45	Shipper Association Traffic	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
46	Misc Mixed Shipments	337,392	0.1%	16,412	0.1%	\$1,947	0.4%	\$5,771
47	Small Packaged Shipments	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
48	Waste	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
49	Hazardous Materials	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
50	Secondary Traffic	43,355,736	18.8%	2,190,057	14.8%	\$68,527	15.8%	\$1,581
60	Unclassified	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
	Total	230,212,488	100.0%	14,805,680	100.0%	\$433,794	100.0%	\$1,884

Source: prepared by CDM Smith, based on TRANSEARCH® data for 2011

Appendix A: Attachments A-D

Table 19: Rail Outbound, 2011

STCC2	Commodity	Tons		Units		Value (in millions)		Average Value/Ton
		Amount	Percent	Amount	Percent	Amount	Percent	
01	Farm Prods.	3,057,210	14.2%	29,810	5.5%	\$543	1.3%	\$177
08	Forest Prods.	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
09	Fresh Fish or Marine Prods.	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
10	Metallic Ores	880	0.0%	40	0.0%	\$0	0.0%	\$8
11	Coal	30,806	0.1%	252	0.0%	\$1	0.0%	\$37
13	Crude Petrol. or Natural Gas	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
14	Nonmetallic Minerals	760,774	3.5%	8,020	1.5%	\$7	0.0%	\$9
19	Ordinance or Accessories	600	0.0%	40	0.0%	#N/A	#N/A	#N/A
20	Food or Kindred Prods.	4,985,925	23.2%	70,897	13.1%	\$2,773	6.9%	\$556
21	Tobacco Prods.	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
22	Textile Mill Prods.	560	0.0%	40	0.0%	\$3	0.0%	\$5,645
23	Apparel or Related Prods.	101,320	0.5%	8,600	1.6%	\$494	1.2%	\$4,880
24	Lumber or Wood Prods.	307,200	1.4%	4,360	0.8%	\$112	0.3%	\$364
25	Furniture or Fixtures	17,200	0.1%	1,000	0.2%	\$79	0.2%	\$4,607
26	Pulp, Paper or Allied Prods.	77,480	0.4%	6,320	1.2%	\$91	0.2%	\$1,172
27	Printed Matter	7,200	0.0%	640	0.1%	\$32	0.1%	\$4,446
28	Chemicals or Allied Prods.	1,923,855	8.9%	29,657	5.5%	\$3,079	7.6%	\$1,600
29	Petroleum or Coal Prods.	61,280	0.3%	1,040	0.2%	\$71	0.2%	\$1,156
30	Rubber or Misc Plastics	30,040	0.1%	2,200	0.4%	\$135	0.3%	\$4,500
31	Leather or Leather Prods.	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
32	Clay, Concrete, Glass, or Stone	3,148,976	14.6%	32,596	6.0%	\$415	1.0%	\$132
33	Primary Metal Prods.	281,000	1.3%	3,240	0.6%	\$715	1.8%	\$2,544
34	Fabricated Metal Prods.	27,400	0.1%	1,800	0.3%	\$120	0.3%	\$4,382
35	Machinery	8,120	0.0%	520	0.1%	\$90	0.2%	\$11,090
36	Electrical Equipment	60,640	0.3%	4,960	0.9%	\$473	1.2%	\$7,798
37	Transportation Equipment	2,058,576	9.6%	115,230	21.4%	\$19,352	47.9%	\$9,400
38	Instrum., Photo Eq., Optical Eq.	1,200	0.0%	120	0.0%	\$14	0.0%	\$11,884
39	Misc Manufacturing Prods.	8,680	0.0%	760	0.1%	\$65	0.2%	\$7,470
40	Waste or Scrap Materials	2,091,984	9.7%	22,508	4.2%	\$527	1.3%	\$252
41	Misc Freight Shipments	13,215	0.1%	659	0.1%	\$6	0.0%	\$484
42	Shipping Containers	114,512	0.5%	14,916	2.8%	\$3	0.0%	\$23
43	Mail or Contract Traffic	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
44	Freight Forwarder Traffic	58,600	0.3%	3,640	0.7%	#N/A	#N/A	#N/A
45	Shipper Association Traffic	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
46	Misc Mixed Shipments	2,257,360	10.5%	173,840	32.2%	\$11,165	27.7%	\$4,946
47	Small Packaged Shipments	17,840	0.1%	1,440	0.3%	#N/A	#N/A	#N/A
48	Waste	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
49	Hazardous Materials	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
50	Secondary Traffic	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
60	Unclassified	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
	Total	21,510,433	100.0%	539,145	100.0%	\$40,364	100.0%	\$1,876

Source: prepared by CDM Smith, based on TRANSEARCH® data for 2011

Appendix A: Attachments A-D

Table 20: Rail Inbound, 2011

STCC2	Commodity	Tons		Units		Value (in millions)		Average Value/Ton
		Amount	Percent	Amount	Percent	Amount	Percent	
01	Farm Prods.	2,932,628	3.2%	28,574	2.6%	\$593	1.5%	\$202
08	Forest Prods.	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
09	Fresh Fish or Marine Prods.	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
10	Metallic Ores	11,520	0.0%	120	0.0%	\$0	0.0%	\$31
11	Coal	74,006,730	80.2%	619,890	56.3%	\$2,704	6.8%	\$37
13	Crude Petrol. or Natural Gas	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
14	Nonmetallic Minerals	534,127	0.6%	5,943	0.5%	\$11	0.0%	\$21
19	Ordinance or Accessories	400	0.0%	40	0.0%	#N/A	#N/A	#N/A
20	Food or Kindred Prods.	4,030,193	4.4%	46,087	4.2%	\$2,182	5.5%	\$541
21	Tobacco Prods.	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
22	Textile Mill Prods.	4,120	0.0%	400	0.0%	\$22	0.1%	\$5,405
23	Apparel or Related Prods.	127,960	0.1%	11,760	1.1%	\$824	2.1%	\$6,442
24	Lumber or Wood Prods.	656,512	0.7%	7,936	0.7%	\$187	0.5%	\$284
25	Furniture or Fixtures	7,400	0.0%	1,160	0.1%	\$32	0.1%	\$4,262
26	Pulp, Paper or Allied Prods.	838,040	0.9%	18,560	1.7%	\$814	2.1%	\$971
27	Printed Matter	800	0.0%	80	0.0%	\$5	0.0%	\$6,585
28	Chemicals or Allied Prods.	2,904,422	3.1%	34,123	3.1%	\$3,576	9.0%	\$1,231
29	Petroleum or Coal Prods.	386,292	0.4%	4,632	0.4%	\$437	1.1%	\$1,130
30	Rubber or Misc Plastics	53,280	0.1%	4,320	0.4%	\$210	0.5%	\$3,943
31	Leather or Leather Prods.	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
32	Clay, Concrete, Glass, or Stone	472,676	0.5%	4,876	0.4%	\$115	0.3%	\$243
33	Primary Metal Prods.	1,084,580	1.2%	12,120	1.1%	\$2,209	5.6%	\$2,037
34	Fabricated Metal Prods.	28,600	0.0%	2,120	0.2%	\$166	0.4%	\$5,798
35	Machinery	3,400	0.0%	80	0.0%	\$39	0.1%	\$11,514
36	Electrical Equipment	20,880	0.0%	1,240	0.1%	\$125	0.3%	\$5,996
37	Transportation Equipment	1,927,652	2.1%	103,748	9.4%	\$16,014	40.4%	\$8,308
38	Instrum., Photo Eq., Optical Eq.	880	0.0%	40	0.0%	\$5	0.0%	\$5,971
39	Misc Manufacturing Prods.	15,560	0.0%	1,360	0.1%	\$126	0.3%	\$8,087
40	Waste or Scrap Materials	50,476	0.1%	1,852	0.2%	\$9	0.0%	\$187
41	Misc Freight Shipments	21,585	0.0%	1,543	0.1%	\$63	0.2%	\$2,912
42	Shipping Containers	333,160	0.4%	35,920	3.3%	#N/A	#N/A	#N/A
43	Mail or Contract Traffic	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
44	Freight Forwarder Traffic	10,760	0.0%	640	0.1%	#N/A	#N/A	#N/A
45	Shipper Association Traffic	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
46	Misc Mixed Shipments	1,818,400	2.0%	150,320	13.7%	\$9,178	23.2%	\$5,047
47	Small Packaged Shipments	3,160	0.0%	240	0.0%	#N/A	#N/A	#N/A
48	Waste	40,600	0.0%	560	0.1%	#N/A	#N/A	#N/A
49	Hazardous Materials	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
50	Secondary Traffic	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
60	Unclassified	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
	Total	92,326,793	100.0%	1,100,284	100.0%	\$39,647	100.0%	\$429

Source: prepared by CDM Smith, based on TRANSEARCH® data for 2011

Appendix A: Attachments A-D

Table 21: Rail Intra, 2011

STCC2	Commodity	Tons		Units		Value (in millions)		Average Value/Ton
		Amount	Percent	Amount	Percent	Amount	Percent	
01	Farm Prods.	177,820	7.3%	1,712	6.6%	\$34	2.1%	\$194
08	Forest Prods.	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
09	Fresh Fish or Marine Prods.	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
10	Metallic Ores	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
11	Coal	1,222,290	50.2%	10,454	40.6%	\$45	2.8%	\$37
13	Crude Petrol. or Natural Gas	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
14	Nonmetallic Minerals	177,459	7.3%	2,180	8.5%	\$1	0.1%	\$8
19	Ordnance or Accessories	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
20	Food or Kindred Prods.	131,388	5.4%	1,328	5.2%	\$80	4.9%	\$609
21	Tobacco Prods.	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
22	Textile Mill Prods.	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
23	Apparel or Related Prods.	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
24	Lumber or Wood Prods.	16,720	0.7%	240	0.9%	\$8	0.5%	\$490
25	Furniture or Fixtures	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
26	Pulp, Paper or Allied Prods.	1,880	0.1%	40	0.2%	\$1	0.1%	\$720
27	Printed Matter	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
28	Chemicals or Allied Prods.	107,560	4.4%	1,172	4.5%	\$192	11.9%	\$1,781
29	Petroleum or Coal Prods.	3,440	0.1%	80	0.3%	\$1	0.1%	\$308
30	Rubber or Misc Plastics	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
31	Leather or Leather Prods.	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
32	Clay, Concrete, Glass, or Stone	513,704	21.1%	5,164	20.0%	\$86	5.4%	\$168
33	Primary Metal Prods.	6,200	0.3%	80	0.3%	\$36	2.2%	\$5,734
34	Fabricated Metal Prods.	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
35	Machinery	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
36	Electrical Equipment	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
37	Transportation Equipment	74,266	3.0%	3,090	12.0%	\$1,125	69.6%	\$15,144
38	Instrum., Photo Eq., Optical Eq.	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
39	Misc Manufacturing Prods.	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
40	Waste or Scrap Materials	520	0.0%	40	0.2%	\$0	0.0%	\$296
41	Misc Freight Shipments	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
42	Shipping Containers	1,200	0.0%	40	0.2%	#N/A	#N/A	#N/A
43	Mail or Contract Traffic	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
44	Freight Forwarder Traffic	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
45	Shipper Association Traffic	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
46	Misc Mixed Shipments	1,200	0.0%	120	0.5%	\$6	0.4%	\$5,063
47	Small Packaged Shipments	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
48	Waste	440	0.0%	40	0.2%	#N/A	#N/A	#N/A
49	Hazardous Materials	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
50	Secondary Traffic	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
60	Unclassified	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
	Total	2,436,087	100.0%	25,780	100.0%	\$1,616	100.0%	\$663

Source: prepared by CDM Smith, based on TRANSEARCH® data for 2011

Appendix A: Attachments A-D

Table 22: Rail Through, 2011

STCC2	Commodity	Tons		Units		Value (in millions)		Average Value/Ton
		Amount	Percent	Amount	Percent	Amount	Percent	
01	Farm Prods.	30,015,640	8.8%	429,065	6.5%	\$6,562	1.7%	\$219
08	Forest Prods.	9,040	0.0%	280	0.0%	\$17	0.0%	\$1,839
09	Fresh Fish or Marine Prods.	35,160	0.0%	1,840	0.0%	\$257	0.1%	\$7,301
10	Metallic Ores	3,681,532	1.1%	35,899	0.5%	\$427	0.1%	\$116
11	Coal	148,656,555	43.5%	1,250,261	19.1%	\$5,433	1.4%	\$37
13	Crude Petrol. or Natural Gas	3,777,206	1.1%	39,628	0.6%	\$2,500	0.7%	\$662
14	Nonmetallic Minerals	11,076,987	3.2%	113,262	1.7%	\$151	0.0%	\$14
19	Ordinance or Accessories	72,844	0.0%	2,216	0.0%	#N/A	#N/A	#N/A
20	Food or Kindred Prods.	30,140,788	8.8%	448,249	6.8%	\$23,307	6.1%	\$773
21	Tobacco Prods.	360	0.0%	80	0.0%	\$8	0.0%	\$21,945
22	Textile Mill Prods.	23,440	0.0%	1,880	0.0%	\$126	0.0%	\$5,354
23	Apparel or Related Prods.	707,920	0.2%	53,200	0.8%	\$4,232	1.1%	\$5,978
24	Lumber or Wood Prods.	2,384,904	0.7%	33,128	0.5%	\$755	0.2%	\$317
25	Furniture or Fixtures	324,160	0.1%	30,640	0.5%	\$1,373	0.4%	\$4,236
26	Pulp, Paper or Allied Prods.	3,930,000	1.1%	99,000	1.5%	\$4,729	1.2%	\$1,203
27	Printed Matter	94,160	0.0%	4,880	0.1%	\$492	0.1%	\$5,220
28	Chemicals or Allied Prods.	33,282,711	9.7%	394,250	6.0%	\$50,055	13.1%	\$1,504
29	Petroleum or Coal Prods.	6,587,592	1.9%	85,624	1.3%	\$7,480	2.0%	\$1,135
30	Rubber or Misc Plastics	750,360	0.2%	53,640	0.8%	\$3,931	1.0%	\$5,239
31	Leather or Leather Prods.	5,160	0.0%	560	0.0%	\$110	0.0%	\$21,295
32	Clay, Concrete, Glass, or Stone	2,987,948	0.9%	37,776	0.6%	\$822	0.2%	\$275
33	Primary Metal Prods.	8,928,619	2.6%	119,736	1.8%	\$15,197	4.0%	\$1,702
34	Fabricated Metal Prods.	390,880	0.1%	26,520	0.4%	\$2,039	0.5%	\$5,216
35	Machinery	358,724	0.1%	14,760	0.2%	\$3,321	0.9%	\$9,257
36	Electrical Equipment	448,052	0.1%	39,976	0.6%	\$2,919	0.8%	\$6,515
37	Transportation Equipment	8,982,756	2.6%	468,920	7.2%	\$74,608	19.5%	\$8,306
38	Instrum., Photo Eq., Optical Eq.	34,760	0.0%	2,720	0.0%	\$417	0.1%	\$11,986
39	Misc Manufacturing Prods.	224,640	0.1%	19,040	0.3%	\$1,740	0.5%	\$7,744
40	Waste or Scrap Materials	6,828,044	2.0%	57,476	0.9%	\$1,660	0.4%	\$243
41	Misc Freight Shipments	624,279	0.2%	79,175	1.2%	\$2,089	0.5%	\$3,346
42	Shipping Containers	708,320	0.2%	137,960	2.1%	\$13	0.0%	\$19
43	Mail or Contract Traffic	16,160	0.0%	1,400	0.0%	\$43	0.0%	\$2,655
44	Freight Forwarder Traffic	1,895,520	0.6%	118,800	1.8%	#N/A	#N/A	#N/A
45	Shipper Association Traffic	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
46	Misc Mixed Shipments	33,105,896	9.7%	2,294,616	35.0%	\$166,599	43.5%	\$5,032
47	Small Packaged Shipments	564,640	0.2%	55,640	0.8%	#N/A	#N/A	#N/A
48	Waste	149,840	0.0%	2,280	0.0%	#N/A	#N/A	#N/A
49	Hazardous Materials	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
50	Secondary Traffic	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
60	Unclassified	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
	Total	341,805,597	100.0%	6,554,377	100.0%	\$383,409	100.0%	\$1,122

Source: prepared by CDM Smith, based on TRANSEARCH® data for 2011

Appendix A: Attachments A-D

Table 23: Port Outbound, 2011

STCC2	Commodity	Tons		Units		Value (in millions)		Average Value/Ton
		Amount	Percent	Amount	Percent	Amount	Percent	
01	Farm Prods.	4,916,145	24.6%	#N/A	#N/A	\$960	27.6%	\$195
08	Forest Prods.	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
09	Fresh Fish or Marine Prods.	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
10	Metallic Ores	111,109	0.6%	#N/A	#N/A	\$446	12.8%	\$4,016
11	Coal	6,932,893	34.7%	#N/A	#N/A	\$253	7.3%	\$37
13	Crude Petrol. or Natural Gas	93,557	0.5%	#N/A	#N/A	\$65	1.9%	\$693
14	Nonmetallic Minerals	2,543,749	12.7%	#N/A	#N/A	\$27	0.8%	\$11
19	Ordnance or Accessories	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
20	Food or Kindred Prods.	466,273	2.3%	#N/A	#N/A	\$151	4.3%	\$323
21	Tobacco Prods.	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
22	Textile Mill Prods.	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
23	Apparel or Related Prods.	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
24	Lumber or Wood Prods.	319,517	1.6%	#N/A	#N/A	\$40	1.1%	\$124
25	Furniture or Fixtures	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
26	Pulp, Paper or Allied Prods.	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
27	Printed Matter	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
28	Chemicals or Allied Prods.	854,693	4.3%	#N/A	#N/A	\$976	28.1%	\$1,142
29	Petroleum or Coal Prods.	150,009	0.8%	#N/A	#N/A	\$21	0.6%	\$141
30	Rubber or Misc Plastics	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
31	Leather or Leather Prods.	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
32	Clay, Concrete, Glass, or Stone	3,364,365	16.8%	#N/A	#N/A	\$458	13.2%	\$136
33	Primary Metal Prods.	266	0.0%	#N/A	#N/A	\$0	0.0%	\$1,601
34	Fabricated Metal Prods.	103	0.0%	#N/A	#N/A	\$0	0.0%	\$2,833
35	Machinery	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
36	Electrical Equipment	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
37	Transportation Equipment	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
38	Instrum., Photo Eq., Optical Eq.	794	0.0%	#N/A	#N/A	\$13	0.4%	\$15,920
39	Misc Manufacturing Prods.	953	0.0%	#N/A	#N/A	\$4	0.1%	\$4,267
40	Waste or Scrap Materials	218,865	1.1%	#N/A	#N/A	\$65	1.9%	\$296
41	Misc Freight Shipments	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
42	Shipping Containers	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
43	Mail or Contract Traffic	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
44	Freight Forwarder Traffic	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
45	Shipper Association Traffic	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
46	Misc Mixed Shipments	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
47	Small Packaged Shipments	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
48	Waste	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
49	Hazardous Materials	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
50	Secondary Traffic	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
60	Unclassified	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
	Total	19,973,291	100.0%	#N/A	#N/A	\$3,479	100.0%	\$174

Source: prepared by CDM Smith, based on TRANSEARCH® data for 2011

Appendix A: Attachments A-D

Table 24: Port Inbound, 2011

STCC2	Commodity	Tons		Units		Value (in millions)		Average Value/Ton
		Amount	Percent	Amount	Percent	Amount	Percent	
01	Farm Prods.	219,950	4.3%	#N/A	#N/A	\$60	1.9%	\$272
08	Forest Prods.	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
09	Fresh Fish or Marine Prods.	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
10	Metallic Ores	522,394	10.3%	#N/A	#N/A	\$15	0.5%	\$28
11	Coal	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
13	Crude Petrol. or Natural Gas	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
14	Nonmetallic Minerals	678,775	13.3%	#N/A	#N/A	\$14	0.5%	\$21
19	Ordnance or Accessories	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
20	Food or Kindred Prods.	11,462	0.2%	#N/A	#N/A	\$2	0.1%	\$214
21	Tobacco Prods.	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
22	Textile Mill Prods.	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
23	Apparel or Related Prods.	212	0.0%	#N/A	#N/A	\$3	0.1%	\$12,254
24	Lumber or Wood Prods.	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
25	Furniture or Fixtures	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
26	Pulp, Paper or Allied Prods.	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
27	Printed Matter	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
28	Chemicals or Allied Prods.	1,711,246	33.6%	#N/A	#N/A	\$1,092	35.4%	\$638
29	Petroleum or Coal Prods.	1,663,932	32.7%	#N/A	#N/A	\$1,531	49.7%	\$920
30	Rubber or Misc Plastics	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
31	Leather or Leather Prods.	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
32	Clay, Concrete, Glass, or Stone	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
33	Primary Metal Prods.	123,057	2.4%	#N/A	#N/A	\$164	5.3%	\$1,337
34	Fabricated Metal Prods.	32,204	0.6%	#N/A	#N/A	\$105	3.4%	\$3,247
35	Machinery	6,881	0.1%	#N/A	#N/A	\$60	2.0%	\$8,763
36	Electrical Equipment	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
37	Transportation Equipment	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
38	Instrum., Photo Eq., Optical Eq.	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
39	Misc Manufacturing Prods.	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
40	Waste or Scrap Materials	123,735	2.4%	#N/A	#N/A	\$37	1.2%	\$296
41	Misc Freight Shipments	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
42	Shipping Containers	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
43	Mail or Contract Traffic	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
44	Freight Forwarder Traffic	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
45	Shipper Association Traffic	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
46	Misc Mixed Shipments	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
47	Small Packaged Shipments	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
48	Waste	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
49	Hazardous Materials	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
50	Secondary Traffic	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
60	Unclassified	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
	Total	5,093,847	100.0%	#N/A	#N/A	\$3,083	100.0%	\$605

Source: prepared by CDM Smith, based on TRANSEARCH® data for 2011

Appendix A: Attachments A-D

Table 25: Port Intra, 2011

STCC2	Commodity	Tons		Units		Value (in millions)		Average Value/Ton
		Amount	Percent	Amount	Percent	Amount	Percent	
01	Farm Prods.	17,759	0.4%	#N/A	#N/A	\$5	4.2%	\$275
08	Forest Prods.	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
09	Fresh Fish or Marine Prods.	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
10	Metallic Ores	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
11	Coal	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
13	Crude Petrol. or Natural Gas	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
14	Nonmetallic Minerals	4,261,659	86.2%	#N/A	#N/A	\$33	28.4%	\$8
19	Ordinance or Accessories	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
20	Food or Kindred Prods.	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
21	Tobacco Prods.	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
22	Textile Mill Prods.	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
23	Apparel or Related Prods.	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
24	Lumber or Wood Prods.	432	0.0%	#N/A	#N/A	\$0	0.0%	\$124
25	Furniture or Fixtures	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
26	Pulp, Paper or Allied Prods.	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
27	Printed Matter	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
28	Chemicals or Allied Prods.	34,128	0.7%	#N/A	#N/A	\$16	13.9%	\$476
29	Petroleum or Coal Prods.	18,800	0.4%	#N/A	#N/A	\$2	1.6%	\$99
30	Rubber or Misc Plastics	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
31	Leather or Leather Prods.	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
32	Clay, Concrete, Glass, or Stone	606,917	12.3%	#N/A	#N/A	\$59	50.0%	\$97
33	Primary Metal Prods.	1,808	0.0%	#N/A	#N/A	\$2	2.0%	\$1,289
34	Fabricated Metal Prods.	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
35	Machinery	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
36	Electrical Equipment	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
37	Transportation Equipment	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
38	Instrum., Photo Eq., Optical Eq.	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
39	Misc Manufacturing Prods.	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
40	Waste or Scrap Materials	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
41	Misc Freight Shipments	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
42	Shipping Containers	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
43	Mail or Contract Traffic	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
44	Freight Forwarder Traffic	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
45	Shipper Association Traffic	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
46	Misc Mixed Shipments	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
47	Small Packaged Shipments	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
48	Waste	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
49	Hazardous Materials	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
50	Secondary Traffic	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
60	Unclassified	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
	Total	4,941,503	100.0%	#N/A	#N/A	\$117	100.0%	\$24

Source: prepared by CDM Smith, based on TRANSEARCH® data for 2011

Appendix A: Attachments A-D

Table 26: Port Through, 2011

STCC2	Commodity	Tons		Units		Value (in millions)		Average Value/Ton
		Amount	Percent	Amount	Percent	Amount	Percent	
01	Farm Prods.	5,689,319	28.7%	#N/A	#N/A	\$1,116	19.0%	\$196
08	Forest Prods.	3,359	0.0%	#N/A	#N/A	\$3	0.1%	\$946
09	Fresh Fish or Marine Prods.	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
10	Metallic Ores	76,714	0.4%	#N/A	#N/A	\$57	1.0%	\$747
11	Coal	5,698,313	28.7%	#N/A	#N/A	\$208	3.5%	\$37
13	Crude Petrol. or Natural Gas	917,761	4.6%	#N/A	#N/A	\$636	10.8%	\$693
14	Nonmetallic Minerals	1,277,851	6.4%	#N/A	#N/A	\$30	0.5%	\$23
19	Ordinance or Accessories	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
20	Food or Kindred Prods.	1,219,871	6.1%	#N/A	#N/A	\$408	6.9%	\$334
21	Tobacco Prods.	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
22	Textile Mill Prods.	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
23	Apparel or Related Prods.	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
24	Lumber or Wood Prods.	15,342	0.1%	#N/A	#N/A	\$2	0.0%	\$124
25	Furniture or Fixtures	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
26	Pulp, Paper or Allied Prods.	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
27	Printed Matter	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
28	Chemicals or Allied Prods.	2,007,920	10.1%	#N/A	#N/A	\$1,399	23.8%	\$697
29	Petroleum or Coal Prods.	2,386,084	12.0%	#N/A	#N/A	\$1,484	25.3%	\$622
30	Rubber or Misc Plastics	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
31	Leather or Leather Prods.	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
32	Clay, Concrete, Glass, or Stone	304,270	1.5%	#N/A	#N/A	\$42	0.7%	\$139
33	Primary Metal Prods.	140,017	0.7%	#N/A	#N/A	\$359	6.1%	\$2,567
34	Fabricated Metal Prods.	29,368	0.1%	#N/A	#N/A	\$79	1.3%	\$2,694
35	Machinery	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
36	Electrical Equipment	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
37	Transportation Equipment	1,996	0.0%	#N/A	#N/A	\$17	0.3%	\$8,632
38	Instrum., Photo Eq., Optical Eq.	125	0.0%	#N/A	#N/A	\$2	0.0%	\$14,993
39	Misc Manufacturing Prods.	464	0.0%	#N/A	#N/A	\$3	0.0%	\$5,585
40	Waste or Scrap Materials	81,269	0.4%	#N/A	#N/A	\$24	0.4%	\$296
41	Misc Freight Shipments	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
42	Shipping Containers	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
43	Mail or Contract Traffic	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
44	Freight Forwarder Traffic	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
45	Shipper Association Traffic	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
46	Misc Mixed Shipments	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
47	Small Packaged Shipments	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
48	Waste	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
49	Hazardous Materials	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
50	Secondary Traffic	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
60	Unclassified	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
	Total	19,850,043	100.0%	#N/A	#N/A	\$5,870	100.0%	\$296

Source: prepared by CDM Smith, based on TRANSEARCH® data for 2011

Appendix A: Attachments A-D

Table 27: Air Outbound, 2011

STCC2	Commodity	Tons		Units		Value (in millions)		Average Value/Ton
		Amount	Percent	Amount	Percent	Amount	Percent	
01	Farm Prods.	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
08	Forest Prods.	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
09	Fresh Fish or Marine Prods.	2	0.0%	#N/A	#N/A	\$0	0.0%	\$4,734
10	Metallic Ores	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
11	Coal	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
13	Crude Petrol. or Natural Gas	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
14	Nonmetallic Minerals	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
19	Ordinance or Accessories	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
20	Food or Kindred Prods.	217	0.6%	#N/A	#N/A	\$1	0.0%	\$5,812
21	Tobacco Prods.	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
22	Textile Mill Prods.	2,299	6.7%	#N/A	#N/A	\$41	0.5%	\$17,645
23	Apparel or Related Prods.	1	0.0%	#N/A	#N/A	\$0	0.0%	\$3,900
24	Lumber or Wood Prods.	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
25	Furniture or Fixtures	82	0.2%	#N/A	#N/A	\$7	0.1%	\$89,889
26	Pulp, Paper or Allied Prods.	122	0.4%	#N/A	#N/A	\$1	0.0%	\$9,148
27	Printed Matter	1,625	4.7%	#N/A	#N/A	\$35	0.5%	\$21,611
28	Chemicals or Allied Prods.	2,245	6.5%	#N/A	#N/A	\$597	7.8%	\$265,999
29	Petroleum or Coal Prods.	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
30	Rubber or Misc Plastics	656	1.9%	#N/A	#N/A	\$20	0.3%	\$29,990
31	Leather or Leather Prods.	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
32	Clay, Concrete, Glass, or Stone	3	0.0%	#N/A	#N/A	\$0	0.0%	\$4,909
33	Primary Metal Prods.	46	0.1%	#N/A	#N/A	\$5	0.1%	\$99,239
34	Fabricated Metal Prods.	2,099	6.1%	#N/A	#N/A	\$58	0.8%	\$27,866
35	Machinery	2,205	6.4%	#N/A	#N/A	\$228	3.0%	\$103,421
36	Electrical Equipment	4,152	12.1%	#N/A	#N/A	\$924	12.1%	\$222,571
37	Transportation Equipment	8,016	23.4%	#N/A	#N/A	\$1,821	23.9%	\$227,199
38	Instrum., Photo Eq., Optical Eq.	1,339	3.9%	#N/A	#N/A	\$277	3.6%	\$206,990
39	Misc Manufacturing Prods.	5,770	16.8%	#N/A	#N/A	\$3,528	46.3%	\$611,409
40	Waste or Scrap Materials	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
41	Misc Freight Shipments	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
42	Shipping Containers	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
43	Mail or Contract Traffic	2,786	8.1%	#N/A	#N/A	\$7	0.1%	\$2,655
44	Freight Forwarder Traffic	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
45	Shipper Association Traffic	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
46	Misc Mixed Shipments	648	1.9%	#N/A	#N/A	\$69	0.9%	\$107,031
47	Small Packaged Shipments	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
48	Waste	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
49	Hazardous Materials	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
50	Secondary Traffic	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
60	Unclassified	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
	Total	34,313	100.0%	#N/A	#N/A	\$7,620	100.0%	\$222,085

Source: prepared by CDM Smith, based on TRANSEARCH® data for 2011

Appendix A: Attachments A-D

Table 28: Air Inbound, 2011

STCC2	Commodity	Tons		Units		Value (in millions)		Average Value/Ton
		Amount	Percent	Amount	Percent	Amount	Percent	
01	Farm Prods.	4	0.0%	#N/A	#N/A	\$0	0.0%	\$8,023
08	Forest Prods.	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
09	Fresh Fish or Marine Prods.	1,408	3.7%	#N/A	#N/A	\$13	0.3%	\$9,004
10	Metallic Ores	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
11	Coal	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
13	Crude Petrol. or Natural Gas	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
14	Nonmetallic Minerals	149	0.4%	#N/A	#N/A	\$0	0.0%	\$1,728
19	Ordnance or Accessories	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
20	Food or Kindred Prods.	803	2.1%	#N/A	#N/A	\$5	0.1%	\$5,856
21	Tobacco Prods.	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
22	Textile Mill Prods.	11,292	29.5%	#N/A	#N/A	\$199	5.4%	\$17,645
23	Apparel or Related Prods.	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
24	Lumber or Wood Prods.	3	0.0%	#N/A	#N/A	\$0	0.0%	\$4,448
25	Furniture or Fixtures	1	0.0%	#N/A	#N/A	\$0	0.0%	\$79,493
26	Pulp, Paper or Allied Prods.	783	2.0%	#N/A	#N/A	\$7	0.2%	\$9,148
27	Printed Matter	5,763	15.1%	#N/A	#N/A	\$125	3.4%	\$21,613
28	Chemicals or Allied Prods.	2,280	6.0%	#N/A	#N/A	\$483	13.2%	\$211,893
29	Petroleum or Coal Prods.	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
30	Rubber or Misc Plastics	483	1.3%	#N/A	#N/A	\$15	0.4%	\$30,068
31	Leather or Leather Prods.	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
32	Clay, Concrete, Glass, or Stone	1	0.0%	#N/A	#N/A	\$0	0.0%	\$6,271
33	Primary Metal Prods.	84	0.2%	#N/A	#N/A	\$9	0.2%	\$102,111
34	Fabricated Metal Prods.	131	0.3%	#N/A	#N/A	\$4	0.1%	\$28,000
35	Machinery	1,820	4.8%	#N/A	#N/A	\$188	5.2%	\$103,487
36	Electrical Equipment	4,906	12.8%	#N/A	#N/A	\$1,097	30.0%	\$223,549
37	Transportation Equipment	1,829	4.8%	#N/A	#N/A	\$411	11.2%	\$224,718
38	Instrum., Photo Eq., Optical Eq.	2,531	6.6%	#N/A	#N/A	\$517	14.1%	\$204,215
39	Misc Manufacturing Prods.	843	2.2%	#N/A	#N/A	\$515	14.1%	\$611,534
40	Waste or Scrap Materials	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
41	Misc Freight Shipments	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
42	Shipping Containers	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
43	Mail or Contract Traffic	2,552	6.7%	#N/A	#N/A	\$7	0.2%	\$2,655
44	Freight Forwarder Traffic	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
45	Shipper Association Traffic	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
46	Misc Mixed Shipments	584	1.5%	#N/A	#N/A	\$62	1.7%	\$107,031
47	Small Packaged Shipments	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
48	Waste	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
49	Hazardous Materials	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
50	Secondary Traffic	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
60	Unclassified	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
	Total	38,249	100.0%	#N/A	#N/A	\$3,656	100.0%	\$95,591

Source: prepared by CDM Smith, based on TRANSEARCH® data for 2011

Appendix A: Attachments A-D

Table 29: Air Intra, 2011

STCC2	Commodity	Tons		Units		Value (in millions)		Average Value/Ton
		Amount	Percent	Amount	Percent	Amount	Percent	
01	Farm Prods.	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
08	Forest Prods.	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
09	Fresh Fish or Marine Prods.	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
10	Metallic Ores	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
11	Coal	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
13	Crude Petrol. or Natural Gas	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
14	Nonmetallic Minerals	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
19	Ordinance or Accessories	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
20	Food or Kindred Prods.	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
21	Tobacco Prods.	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
22	Textile Mill Prods.	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
23	Apparel or Related Prods.	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
24	Lumber or Wood Prods.	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
25	Furniture or Fixtures	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
26	Pulp, Paper or Allied Prods.	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
27	Printed Matter	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
28	Chemicals or Allied Prods.	2	0.5%	#N/A	#N/A	\$1	0.6%	\$308,676
29	Petroleum or Coal Prods.	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
30	Rubber or Misc Plastics	1	0.2%	#N/A	#N/A	\$0	0.0%	\$30,068
31	Leather or Leather Prods.	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
32	Clay, Concrete, Glass, or Stone	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
33	Primary Metal Prods.	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
34	Fabricated Metal Prods.	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
35	Machinery	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
36	Electrical Equipment	292	78.9%	#N/A	#N/A	\$65	65.1%	\$222,699
37	Transportation Equipment	1	0.1%	#N/A	#N/A	\$0	0.1%	\$226,955
38	Instrum., Photo Eq., Optical Eq.	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
39	Misc Manufacturing Prods.	56	15.1%	#N/A	#N/A	\$34	34.2%	\$611,612
40	Waste or Scrap Materials	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
41	Misc Freight Shipments	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
42	Shipping Containers	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
43	Mail or Contract Traffic	19	5.1%	#N/A	#N/A	\$0	0.0%	\$2,655
44	Freight Forwarder Traffic	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
45	Shipper Association Traffic	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
46	Misc Mixed Shipments	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
47	Small Packaged Shipments	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
48	Waste	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
49	Hazardous Materials	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
50	Secondary Traffic	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
60	Unclassified	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
Total		370	100.0%	#N/A	#N/A	\$100	100.0%	\$270,224

Source: prepared by CDM Smith, based on TRANSEARCH® data for 2011

Appendix A: Attachments A-D

Table 30: Air Through, 2011

STCC2	Commodity	Tons		Units		Value (in millions)		Average Value/Ton
		Amount	Percent	Amount	Percent	Amount	Percent	
01	Farm Prods.	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
08	Forest Prods.	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
09	Fresh Fish or Marine Prods.	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
10	Metallic Ores	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
11	Coal	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
13	Crude Petrol. or Natural Gas	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
14	Nonmetallic Minerals	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
19	Ordinance or Accessories	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
20	Food or Kindred Prods.	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
21	Tobacco Prods.	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
22	Textile Mill Prods.	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
23	Apparel or Related Prods.	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
24	Lumber or Wood Prods.	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
25	Furniture or Fixtures	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
26	Pulp, Paper or Allied Prods.	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
27	Printed Matter	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
28	Chemicals or Allied Prods.	12	17.4%	#N/A	#N/A	\$2	15.4%	\$123,389
29	Petroleum or Coal Prods.	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
30	Rubber or Misc Plastics	16	22.7%	#N/A	#N/A	\$0	4.9%	\$30,068
31	Leather or Leather Prods.	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
32	Clay, Concrete, Glass, or Stone	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
33	Primary Metal Prods.	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
34	Fabricated Metal Prods.	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
35	Machinery	2	3.2%	#N/A	#N/A	\$0	2.4%	\$103,725
36	Electrical Equipment	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
37	Transportation Equipment	17	23.4%	#N/A	#N/A	\$4	38.2%	\$226,955
38	Instrum., Photo Eq., Optical Eq.	9	12.7%	#N/A	#N/A	\$2	18.7%	\$204,296
39	Misc Manufacturing Prods.	1	1.3%	#N/A	#N/A	\$1	5.6%	\$611,612
40	Waste or Scrap Materials	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
41	Misc Freight Shipments	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
42	Shipping Containers	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
43	Mail or Contract Traffic	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
44	Freight Forwarder Traffic	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
45	Shipper Association Traffic	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
46	Misc Mixed Shipments	14	19.4%	#N/A	#N/A	\$1	14.9%	\$107,031
47	Small Packaged Shipments	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
48	Waste	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
49	Hazardous Materials	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
50	Secondary Traffic	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
60	Unclassified	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
Total		71	100.0%	#N/A	#N/A	\$10	100.0%	\$139,152

Source: prepared by CDM Smith, based on TRANSEARCH® data for 2011

Appendix A: Attachments A-D

Table 31: Pipeline Outbound, 2011

N/A

Source: prepared by CDM Smith, based on TRANSEARCH[®] data for 2011

Appendix A: Attachments A-D

Table 32: Pipeline Inbound, 2011

STCC2	Commodity	Tons		Units		Value (in millions)		Average Value/Ton
		Amount	Percent	Amount	Percent	Amount	Percent	
01	Farm Prods.	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
08	Forest Prods.	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
09	Fresh Fish or Marine Prods.	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
10	Metallic Ores	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
11	Coal	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
13	Crude Petrol. or Natural Gas	930,883	99.9%	#N/A	#N/A	\$643	99.9%	\$690
14	Nonmetallic Minerals	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
19	Ordinance or Accessories	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
20	Food or Kindred Prods.	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
21	Tobacco Prods.	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
22	Textile Mill Prods.	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
23	Apparel or Related Prods.	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
24	Lumber or Wood Prods.	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
25	Furniture or Fixtures	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
26	Pulp, Paper or Allied Prods.	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
27	Printed Matter	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
28	Chemicals or Allied Prods.	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
29	Petroleum or Coal Prods.	1,376	0.1%	#N/A	#N/A	\$1	0.1%	\$566
30	Rubber or Misc Plastics	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
31	Leather or Leather Prods.	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
32	Clay, Concrete, Glass, or Stone	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
33	Primary Metal Prods.	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
34	Fabricated Metal Prods.	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
35	Machinery	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
36	Electrical Equipment	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
37	Transportation Equipment	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
38	Instrum., Photo Eq., Optical Eq.	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
39	Misc Manufacturing Prods.	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
40	Waste or Scrap Materials	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
41	Misc Freight Shipments	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
42	Shipping Containers	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
43	Mail or Contract Traffic	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
44	Freight Forwarder Traffic	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
45	Shipper Association Traffic	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
46	Misc Mixed Shipments	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
47	Small Packaged Shipments	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
48	Waste	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
49	Hazardous Materials	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
50	Secondary Traffic	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
60	Unclassified	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
Total		932,258	100.0%	#N/A	#N/A	\$643	100.0%	\$690

Source: prepared by CDM Smith, based on TRANSEARCH® data for 2011

Appendix A: Attachments A-D

Table 33: Pipeline Intra, 2011

N/A

Source: prepared by CDM Smith, based on TRANSEARCH[®] data for 2011

Appendix A: Attachments A-D

Table 34: Pipeline Through, 2011

STCC2	Commodity	Tons		Units		Value (in millions)		Average Value/Ton
		Amount	Percent	Amount	Percent	Amount	Percent	
01	Farm Prods.	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
08	Forest Prods.	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
09	Fresh Fish or Marine Prods.	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
10	Metallic Ores	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
11	Coal	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
13	Crude Petrol. or Natural Gas	7,412,827	100.0%	#N/A	#N/A	\$5,117	100.0%	\$690
14	Nonmetallic Minerals	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
19	Ordinance or Accessories	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
20	Food or Kindred Prods.	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
21	Tobacco Prods.	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
22	Textile Mill Prods.	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
23	Apparel or Related Prods.	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
24	Lumber or Wood Prods.	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
25	Furniture or Fixtures	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
26	Pulp, Paper or Allied Prods.	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
27	Printed Matter	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
28	Chemicals or Allied Prods.	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
29	Petroleum or Coal Prods.	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
30	Rubber or Misc Plastics	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
31	Leather or Leather Prods.	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
32	Clay, Concrete, Glass, or Stone	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
33	Primary Metal Prods.	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
34	Fabricated Metal Prods.	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
35	Machinery	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
36	Electrical Equipment	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
37	Transportation Equipment	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
38	Instrum., Photo Eq., Optical Eq.	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
39	Misc Manufacturing Prods.	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
40	Waste or Scrap Materials	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
41	Misc Freight Shipments	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
42	Shipping Containers	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
43	Mail or Contract Traffic	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
44	Freight Forwarder Traffic	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
45	Shipper Association Traffic	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
46	Misc Mixed Shipments	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
47	Small Packaged Shipments	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
48	Waste	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
49	Hazardous Materials	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
50	Secondary Traffic	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
60	Unclassified	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
Total		7,412,827	100.0%	#N/A	#N/A	\$5,117	100.0%	\$690

Source: prepared by CDM Smith, based on TRANSEARCH® data for 2011

Appendix A: Attachments A-D

Table 35: Truck Forecast, 2030

STCC2	Commodity	Tons		Units		Value (in millions)		Average Value/Ton
		Amount	Percent	Amount	Percent	Amount	Percent	
01	Farm Prods.	91,198,773	11.7%	5,513,704	8.7%	\$54,959	4.6%	\$603
08	Forest Prods.	271,330	0.0%	11,674	0.0%	\$554	0.0%	\$2,042
09	Fresh Fish or Marine Prods.	242,621	0.0%	10,463	0.0%	\$1,727	0.1%	\$7,117
10	Metallic Ores	320,925	0.0%	12,645	0.0%	\$4,629	0.4%	\$14,423
11	Coal	1,016,413	0.1%	40,976	0.1%	\$37	0.0%	\$37
13	Crude Petrol. or Natural Gas	860,780	0.1%	35,845	0.1%	\$148	0.0%	\$171
14	Nonmetallic Minerals	202,731,306	26.1%	8,339,306	13.2%	\$2,174	0.2%	\$11
19	Ordinance or Accessories	136,369	0.0%	6,087	0.0%	\$2,827	0.2%	\$20,729
20	Food or Kindred Prods.	77,526,994	10.0%	3,383,432	5.4%	\$96,037	8.0%	\$1,239
21	Tobacco Prods.	108,484	0.0%	4,906	0.0%	\$1,757	0.1%	\$16,199
22	Textile Mill Prods.	547,469	0.1%	25,618	0.0%	\$2,961	0.2%	\$5,409
23	Apparel or Related Prods.	693,130	0.1%	42,247	0.1%	\$7,457	0.6%	\$10,759
24	Lumber or Wood Prods.	19,362,633	2.5%	765,419	1.2%	\$7,217	0.6%	\$373
25	Furniture or Fixtures	2,962,141	0.4%	196,902	0.3%	\$16,692	1.4%	\$5,635
26	Pulp, Paper or Allied Prods.	10,285,966	1.3%	425,401	0.7%	\$16,864	1.4%	\$1,640
27	Printed Matter	2,580,804	0.3%	144,546	0.2%	\$9,046	0.8%	\$3,505
28	Chemicals or Allied Prods.	55,643,373	7.2%	2,720,357	4.3%	\$104,114	8.7%	\$1,871
29	Petroleum or Coal Prods.	34,222,302	4.4%	1,423,228	2.3%	\$28,918	2.4%	\$845
30	Rubber or Misc Plastics	11,193,709	1.4%	946,341	1.5%	\$46,278	3.9%	\$4,134
31	Leather or Leather Prods.	268,874	0.0%	18,199	0.0%	\$4,109	0.3%	\$15,284
32	Clay, Concrete, Glass, or Stone	39,087,990	5.0%	2,422,193	3.8%	\$11,006	0.9%	\$282
33	Primary Metal Prods.	12,479,972	1.6%	500,091	0.8%	\$47,326	4.0%	\$3,792
34	Fabricated Metal Prods.	7,062,178	0.9%	394,259	0.6%	\$27,720	2.3%	\$3,925
35	Machinery	10,008,738	1.3%	737,060	1.2%	\$110,618	9.2%	\$11,052
36	Electrical Equipment	10,317,961	1.3%	621,495	1.0%	\$142,642	11.9%	\$13,825
37	Transportation Equipment	11,471,533	1.5%	826,910	1.3%	\$98,583	8.2%	\$8,594
38	Instrum., Photo Eq., Optical Eq.	1,846,010	0.2%	146,336	0.2%	\$26,367	2.2%	\$14,283
39	Misc Manufacturing Prods.	3,030,391	0.4%	156,442	0.2%	\$18,338	1.5%	\$6,051
40	Waste or Scrap Materials	11,628,820	1.5%	512,727	0.8%	\$3,225	0.3%	\$277
41	Misc Freight Shipments	1,220,366	0.2%	59,361	0.1%	\$4,188	0.3%	\$3,432
42	Shipping Containers	1,078,846	0.1%	24,529,781	38.8%	\$4,804	0.4%	\$4,453
43	Mail or Contract Traffic	1,040,543	0.1%	50,614	0.1%	\$2,762	0.2%	\$2,655
44	Freight Forwarder Traffic	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
45	Shipper Association Traffic	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
46	Misc Mixed Shipments	856,613	0.1%	41,668	0.1%	\$4,896	0.4%	\$5,715
47	Small Packaged Shipments	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
48	Waste	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
49	Hazardous Materials	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
50	Secondary Traffic	154,832,059	19.9%	8,114,982	12.8%	\$285,907	23.9%	\$1,847
60	Unclassified	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
	Total	778,136,417	100.0%	63,181,216	100.0%	\$1,196,888	100.0%	\$1,538

Source: prepared by CDM Smith, based on TRANSEARCH® data for 2030

Appendix A: Attachments A-D

Table 36: Rail Forecast, 2030

STCC2	Commodity	Tons		Units		Value (in millions)		Average Value/Ton
		Amount	Percent	Amount	Percent	Amount	Percent	
01	Farm Prods.	49,297,119	9.0%	637,845	5.3%	\$10,607	1.3%	\$215
08	Forest Prods.	13,768	0.0%	431	0.0%	\$25	0.0%	\$1,831
09	Fresh Fish or Marine Prods.	52,597	0.0%	2,755	0.0%	\$384	0.0%	\$7,301
10	Metallic Ores	2,915,683	0.5%	28,540	0.2%	\$385	0.0%	\$132
11	Coal	192,211,846	35.3%	1,614,534	13.4%	\$7,024	0.9%	\$37
13	Crude Petrol. or Natural Gas	5,578,525	1.0%	58,696	0.5%	\$3,639	0.5%	\$652
14	Nonmetallic Minerals	16,690,092	3.1%	172,370	1.4%	\$213	0.0%	\$13
19	Ordinance or Accessories	89,846	0.0%	2,888	0.0%	#N/A	#N/A	#N/A
20	Food or Kindred Prods.	54,000,706	9.9%	801,050	6.7%	\$39,101	4.9%	\$724
21	Tobacco Prods.	130	0.0%	29	0.0%	\$3	0.0%	\$21,945
22	Textile Mill Prods.	22,604	0.0%	1,827	0.0%	\$115	0.0%	\$5,084
23	Apparel or Related Prods.	514,631	0.1%	39,536	0.3%	\$3,084	0.4%	\$5,993
24	Lumber or Wood Prods.	5,248,599	1.0%	73,944	0.6%	\$1,700	0.2%	\$324
25	Furniture or Fixtures	524,664	0.1%	48,027	0.4%	\$2,281	0.3%	\$4,348
26	Pulp, Paper or Allied Prods.	6,860,974	1.3%	181,749	1.5%	\$8,450	1.1%	\$1,232
27	Printed Matter	120,657	0.0%	6,595	0.1%	\$626	0.1%	\$5,189
28	Chemicals or Allied Prods.	49,944,520	9.2%	608,650	5.1%	\$79,588	10.1%	\$1,594
29	Petroleum or Coal Prods.	6,730,213	1.2%	86,658	0.7%	\$7,656	1.0%	\$1,138
30	Rubber or Misc Plastics	1,275,803	0.2%	94,738	0.8%	\$6,261	0.8%	\$4,907
31	Leather or Leather Prods.	5,158	0.0%	572	0.0%	\$109	0.0%	\$21,147
32	Clay, Concrete, Glass, or Stone	16,554,994	3.0%	182,492	1.5%	\$2,847	0.4%	\$172
33	Primary Metal Prods.	14,434,460	2.6%	194,529	1.6%	\$25,770	3.3%	\$1,785
34	Fabricated Metal Prods.	627,779	0.1%	42,642	0.4%	\$3,238	0.4%	\$5,157
35	Machinery	811,871	0.1%	34,310	0.3%	\$7,364	0.9%	\$9,071
36	Electrical Equipment	879,821	0.2%	74,643	0.6%	\$6,264	0.8%	\$7,119
37	Transportation Equipment	27,021,809	5.0%	1,388,206	11.5%	\$235,416	29.8%	\$8,712
38	Instrum., Photo Eq., Optical Eq.	84,437	0.0%	6,942	0.1%	\$1,057	0.1%	\$12,514
39	Misc Manufacturing Prods.	444,790	0.1%	40,626	0.3%	\$3,527	0.4%	\$7,929
40	Waste or Scrap Materials	18,956,946	3.5%	147,030	1.2%	\$4,621	0.6%	\$244
41	Misc Freight Shipments	1,257,442	0.2%	157,832	1.3%	\$4,115	0.5%	\$3,272
42	Shipping Containers	2,199,959	0.4%	370,646	3.1%	\$28	0.0%	\$13
43	Mail or Contract Traffic	12,016	0.0%	1,041	0.0%	\$32	0.0%	\$2,655
44	Freight Forwarder Traffic	3,788,837	0.7%	237,333	2.0%	#N/A	#N/A	#N/A
45	Shipper Association Traffic	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
46	Misc Mixed Shipments	64,604,197	11.9%	4,568,704	38.0%	\$325,067	41.1%	\$5,032
47	Small Packaged Shipments	1,127,524	0.2%	110,357	0.9%	#N/A	#N/A	#N/A
48	Waste	261,035	0.0%	3,833	0.0%	#N/A	#N/A	#N/A
49	Hazardous Materials	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
50	Secondary Traffic	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
60	Unclassified	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
	Total	545,166,049	100.0%	12,022,600	100.0%	\$790,595	100.0%	\$1,450

Source: prepared by CDM Smith, based on TRANSEARCH® data for 2030

Appendix A: Attachments A-D

Table 37: Port Forecast, 2030

STCC2	Commodity	Tons		Units		Value (in millions)		Average Value/Ton
		Amount	Percent	Amount	Percent	Amount	Percent	
01	Farm Prods.	11,079,327	17.5%	#N/A	#N/A	\$2,234	14.5%	\$202
08	Forest Prods.	6,503	0.0%	#N/A	#N/A	\$6	0.0%	\$946
09	Fresh Fish or Marine Prods.	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
10	Metallic Ores	600,930	1.0%	#N/A	#N/A	\$428	2.8%	\$712
11	Coal	10,910,523	17.2%	#N/A	#N/A	\$399	2.6%	\$37
13	Crude Petrol. or Natural Gas	2,528,825	4.0%	#N/A	#N/A	\$1,754	11.4%	\$693
14	Nonmetallic Minerals	14,674,855	23.2%	#N/A	#N/A	\$172	1.1%	\$12
19	Ordinance or Accessories	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
20	Food or Kindred Prods.	1,977,799	3.1%	#N/A	#N/A	\$665	4.3%	\$336
21	Tobacco Prods.	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
22	Textile Mill Prods.	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
23	Apparel or Related Prods.	149	0.0%	#N/A	#N/A	\$2	0.0%	\$12,702
24	Lumber or Wood Prods.	1,081,189	1.7%	#N/A	#N/A	\$134	0.9%	\$124
25	Furniture or Fixtures	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
26	Pulp, Paper or Allied Prods.	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
27	Printed Matter	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
28	Chemicals or Allied Prods.	4,910,317	7.8%	#N/A	#N/A	\$3,746	24.3%	\$763
29	Petroleum or Coal Prods.	3,857,417	6.1%	#N/A	#N/A	\$2,765	17.9%	\$717
30	Rubber or Misc Plastics	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
31	Leather or Leather Prods.	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
32	Clay, Concrete, Glass, or Stone	10,496,973	16.6%	#N/A	#N/A	\$1,330	8.6%	\$127
33	Primary Metal Prods.	564,618	0.9%	#N/A	#N/A	\$1,121	7.3%	\$1,985
34	Fabricated Metal Prods.	155,526	0.2%	#N/A	#N/A	\$479	3.1%	\$3,078
35	Machinery	8,231	0.0%	#N/A	#N/A	\$69	0.4%	\$8,399
36	Electrical Equipment	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
37	Transportation Equipment	631	0.0%	#N/A	#N/A	\$5	0.0%	\$8,630
38	Instrum., Photo Eq., Optical Eq.	1,160	0.0%	#N/A	#N/A	\$17	0.1%	\$14,498
39	Misc Manufacturing Prods.	1,085	0.0%	#N/A	#N/A	\$5	0.0%	\$4,444
40	Waste or Scrap Materials	398,802	0.6%	#N/A	#N/A	\$118	0.8%	\$296
41	Misc Freight Shipments	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
42	Shipping Containers	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
43	Mail or Contract Traffic	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
44	Freight Forwarder Traffic	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
45	Shipper Association Traffic	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
46	Misc Mixed Shipments	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
47	Small Packaged Shipments	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
48	Waste	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
49	Hazardous Materials	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
50	Secondary Traffic	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
60	Unclassified	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
	Total	63,254,857	100.0%	#N/A	#N/A	\$15,448	100.0%	\$244

Source: prepared by CDM Smith, based on TRANSEARCH® data for 2030

Appendix A: Attachments A-D

Table 38: Air Forecast, 2030

STCC2	Commodity	Tons		Units		Value (in millions)		Average Value/Ton
		Amount	Percent	Amount	Percent	Amount	Percent	
01	Farm Prods.	5	0.0%	#N/A	#N/A	\$0	0.0%	\$8,023
08	Forest Prods.	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
09	Fresh Fish or Marine Prods.	1,882	1.4%	#N/A	#N/A	\$17	0.1%	\$8,997
10	Metallic Ores	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
11	Coal	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
13	Crude Petrol. or Natural Gas	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
14	Nonmetallic Minerals	204	0.1%	#N/A	#N/A	\$0	0.0%	\$1,728
19	Ordinance or Accessories	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
20	Food or Kindred Prods.	1,440	1.0%	#N/A	#N/A	\$8	0.0%	\$5,846
21	Tobacco Prods.	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
22	Textile Mill Prods.	30,213	21.7%	#N/A	#N/A	\$533	1.9%	\$17,645
23	Apparel or Related Prods.	2	0.0%	#N/A	#N/A	\$0	0.0%	\$3,900
24	Lumber or Wood Prods.	8	0.0%	#N/A	#N/A	\$0	0.0%	\$4,448
25	Furniture or Fixtures	54	0.0%	#N/A	#N/A	\$5	0.0%	\$87,164
26	Pulp, Paper or Allied Prods.	1,291	0.9%	#N/A	#N/A	\$12	0.0%	\$9,148
27	Printed Matter	6,701	4.8%	#N/A	#N/A	\$145	0.5%	\$21,607
28	Chemicals or Allied Prods.	8,961	6.4%	#N/A	#N/A	\$2,219	8.1%	\$247,617
29	Petroleum or Coal Prods.	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
30	Rubber or Misc Plastics	1,919	1.4%	#N/A	#N/A	\$58	0.2%	\$30,017
31	Leather or Leather Prods.	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
32	Clay, Concrete, Glass, or Stone	10	0.0%	#N/A	#N/A	\$0	0.0%	\$5,187
33	Primary Metal Prods.	159	0.1%	#N/A	#N/A	\$16	0.1%	\$100,699
34	Fabricated Metal Prods.	2,709	1.9%	#N/A	#N/A	\$75	0.3%	\$27,794
35	Machinery	5,726	4.1%	#N/A	#N/A	\$591	2.1%	\$103,234
36	Electrical Equipment	29,156	20.9%	#N/A	#N/A	\$6,501	23.6%	\$222,963
37	Transportation Equipment	13,842	9.9%	#N/A	#N/A	\$3,141	11.4%	\$226,937
38	Instrum., Photo Eq., Optical Eq.	9,912	7.1%	#N/A	#N/A	\$2,035	7.4%	\$205,273
39	Misc Manufacturing Prods.	19,563	14.0%	#N/A	#N/A	\$11,962	43.4%	\$611,439
40	Waste or Scrap Materials	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
41	Misc Freight Shipments	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
42	Shipping Containers	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
43	Mail or Contract Traffic	3,601	2.6%	#N/A	#N/A	\$10	0.0%	\$2,655
44	Freight Forwarder Traffic	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
45	Shipper Association Traffic	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
46	Misc Mixed Shipments	1,934	1.4%	#N/A	#N/A	\$207	0.8%	\$107,031
47	Small Packaged Shipments	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
48	Waste	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
49	Hazardous Materials	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
50	Secondary Traffic	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
60	Unclassified	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
	Total	139,296	100.0%	#N/A	#N/A	\$27,534	100.0%	\$197,667

Source: prepared by CDM Smith, based on TRANSEARCH® data for 2030

Appendix A: Attachments A-D

Table 39: Pipeline Forecast, 2030

STCC2	Commodity	Tons		Units		Value (in millions)		Average Value/Ton
		Amount	Percent	Amount	Percent	Amount	Percent	
01	Farm Prods.	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
08	Forest Prods.	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
09	Fresh Fish or Marine Prods.	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
10	Metallic Ores	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
11	Coal	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
13	Crude Petrol. or Natural Gas	8,888,178	100.0%	#N/A	#N/A	\$6,136	100.0%	\$690
14	Nonmetallic Minerals	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
19	Ordinance or Accessories	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
20	Food or Kindred Prods.	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
21	Tobacco Prods.	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
22	Textile Mill Prods.	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
23	Apparel or Related Prods.	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
24	Lumber or Wood Prods.	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
25	Furniture or Fixtures	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
26	Pulp, Paper or Allied Prods.	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
27	Printed Matter	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
28	Chemicals or Allied Prods.	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
29	Petroleum or Coal Prods.	2,086	0.0%	#N/A	#N/A	\$1	0.0%	\$566
30	Rubber or Misc Plastics	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
31	Leather or Leather Prods.	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
32	Clay, Concrete, Glass, or Stone	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
33	Primary Metal Prods.	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
34	Fabricated Metal Prods.	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
35	Machinery	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
36	Electrical Equipment	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
37	Transportation Equipment	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
38	Instrum., Photo Eq., Optical Eq.	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
39	Misc Manufacturing Prods.	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
40	Waste or Scrap Materials	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
41	Misc Freight Shipments	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
42	Shipping Containers	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
43	Mail or Contract Traffic	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
44	Freight Forwarder Traffic	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
45	Shipper Association Traffic	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
46	Misc Mixed Shipments	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
47	Small Packaged Shipments	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
48	Waste	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
49	Hazardous Materials	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
50	Secondary Traffic	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
60	Unclassified	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
	Total	8,890,264	100.0%	#N/A	#N/A	\$6,137	100.0%	\$690

Source: prepared by CDM Smith, based on TRANSEARCH® data for 2030

Appendix A: Attachments A-D

Table 40: Truck Forecast Growth, in Tons, 2011 to 2030

STCC2	Commodity	2011		2030		Percent Change	
		Amount	Percent	Amount	Percent	Total	CAGR
01	Farm Prods.	82,173,516	16.4%	91,198,773	11.7%	11.0%	0.5%
08	Forest Prods.	186,153	0.0%	271,330	0.0%	45.8%	2.0%
09	Fresh Fish or Marine Prods.	189,869	0.0%	242,621	0.0%	27.8%	1.3%
10	Metallic Ores	319,950	0.1%	320,925	0.0%	0.3%	0.0%
11	Coal	1,037,757	0.2%	1,016,413	0.1%	-2.1%	-0.1%
13	Crude Petrol. or Natural Gas	742,556	0.1%	860,780	0.1%	15.9%	0.8%
14	Nonmetallic Minerals	102,350,383	20.5%	202,731,306	26.1%	98.1%	3.7%
19	Ordnance or Accessories	97,068	0.0%	136,369	0.0%	40.5%	1.8%
20	Food or Kindred Prods.	57,486,629	11.5%	77,526,994	10.0%	34.9%	1.6%
21	Tobacco Prods.	257,136	0.1%	108,484	0.0%	-57.8%	-4.4%
22	Textile Mill Prods.	490,767	0.1%	547,469	0.1%	11.6%	0.6%
23	Apparel or Related Prods.	739,603	0.1%	693,130	0.1%	-6.3%	-0.3%
24	Lumber or Wood Prods.	13,358,341	2.7%	19,362,633	2.5%	44.9%	2.0%
25	Furniture or Fixtures	1,531,411	0.3%	2,962,141	0.4%	93.4%	3.5%
26	Pulp, Paper or Allied Prods.	6,614,856	1.3%	10,285,966	1.3%	55.5%	2.4%
27	Printed Matter	2,376,146	0.5%	2,580,804	0.3%	8.6%	0.4%
28	Chemicals or Allied Prods.	41,815,924	8.4%	55,643,373	7.2%	33.1%	1.5%
29	Petroleum or Coal Prods.	35,873,267	7.2%	34,222,302	4.4%	-4.6%	-0.2%
30	Rubber or Misc Plastics	6,986,760	1.4%	11,193,709	1.4%	60.2%	2.5%
31	Leather or Leather Prods.	323,357	0.1%	268,874	0.0%	-16.8%	-1.0%
32	Clay, Concrete, Glass, or Stone	20,139,007	4.0%	39,087,990	5.0%	94.1%	3.6%
33	Primary Metal Prods.	8,370,815	1.7%	12,479,972	1.6%	49.1%	2.1%
34	Fabricated Metal Prods.	4,614,982	0.9%	7,062,178	0.9%	53.0%	2.3%
35	Machinery	5,081,369	1.0%	10,008,738	1.3%	97.0%	3.6%
36	Electrical Equipment	4,659,135	0.9%	10,317,961	1.3%	121.5%	4.3%
37	Transportation Equipment	6,354,587	1.3%	11,471,533	1.5%	80.5%	3.2%
38	Instrum., Photo Eq., Optical Eq.	537,895	0.1%	1,846,010	0.2%	243.2%	6.7%
39	Misc Manufacturing Prods.	1,180,593	0.2%	3,030,391	0.4%	156.7%	5.1%
40	Waste or Scrap Materials	7,781,433	1.6%	11,628,820	1.5%	49.4%	2.1%
41	Misc Freight Shipments	693,765	0.1%	1,220,366	0.2%	75.9%	3.0%
42	Shipping Containers	610,148	0.1%	1,078,846	0.1%	76.8%	3.0%
43	Mail or Contract Traffic	1,057,339	0.2%	1,040,543	0.1%	-1.6%	-0.1%
44	Freight Forwarder Traffic	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
45	Shipper Association Traffic	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
46	Misc Mixed Shipments	408,363	0.1%	856,613	0.1%	109.8%	4.0%
47	Small Packaged Shipments	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
48	Waste	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
49	Hazardous Materials	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
50	Secondary Traffic	83,951,649	16.8%	154,832,059	19.9%	84.4%	3.3%
60	Unclassified	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
	Total	500,392,531	100.0%	778,136,417	100.0%	55.5%	2.4%

Source: prepared by CDM Smith, based on TRANSEARCH® data for 2011 and 2030

Appendix A: Attachments A-D

Table 41: Rail Forecast Growth in Tons, 2011 to 2030

STCC2	Commodity	2011		2030		Percent Change	
		Amount	Percent	Amount	Percent	Total	CAGR
01	Farm Prods.	36,183,298	7.9%	49,297,119	9.0%	36.2%	1.6%
08	Forest Prods.	9,040	0.0%	13,768	0.0%	52.3%	2.2%
09	Fresh Fish or Marine Prods.	35,160	0.0%	52,597	0.0%	49.6%	2.1%
10	Metallic Ores	3,693,932	0.8%	2,915,683	0.5%	-21.1%	-1.2%
11	Coal	223,916,381	48.9%	192,211,846	35.3%	-14.2%	-0.8%
13	Crude Petrol. or Natural Gas	3,777,206	0.8%	5,578,525	1.0%	47.7%	2.1%
14	Nonmetallic Minerals	12,549,347	2.7%	16,690,092	3.1%	33.0%	1.5%
19	Ordnance or Accessories	73,844	0.0%	89,846	0.0%	21.7%	1.0%
20	Food or Kindred Prods.	39,288,294	8.6%	54,000,706	9.9%	37.4%	1.7%
21	Tobacco Prods.	360	0.0%	130	0.0%	-63.9%	-5.2%
22	Textile Mill Prods.	28,120	0.0%	22,604	0.0%	-19.6%	-1.1%
23	Apparel or Related Prods.	937,200	0.2%	514,631	0.1%	-45.1%	-3.1%
24	Lumber or Wood Prods.	3,365,336	0.7%	5,248,599	1.0%	56.0%	2.4%
25	Furniture or Fixtures	348,760	0.1%	524,664	0.1%	50.4%	2.2%
26	Pulp, Paper or Allied Prods.	4,847,400	1.1%	6,860,974	1.3%	41.5%	1.8%
27	Printed Matter	102,160	0.0%	120,657	0.0%	18.1%	0.9%
28	Chemicals or Allied Prods.	38,218,548	8.3%	49,944,520	9.2%	30.7%	1.4%
29	Petroleum or Coal Prods.	7,038,604	1.5%	6,730,213	1.2%	-4.4%	-0.2%
30	Rubber or Misc Plastics	833,680	0.2%	1,275,803	0.2%	53.0%	2.3%
31	Leather or Leather Prods.	5,160	0.0%	5,158	0.0%	0.0%	0.0%
32	Clay, Concrete, Glass, or Stone	7,123,304	1.6%	16,554,994	3.0%	132.4%	4.5%
33	Primary Metal Prods.	10,300,399	2.2%	14,434,460	2.6%	40.1%	1.8%
34	Fabricated Metal Prods.	446,880	0.1%	627,779	0.1%	40.5%	1.8%
35	Machinery	370,244	0.1%	811,871	0.1%	119.3%	4.2%
36	Electrical Equipment	529,572	0.1%	879,821	0.2%	66.1%	2.7%
37	Transportation Equipment	13,043,250	2.8%	27,021,809	5.0%	107.2%	3.9%
38	Instrum., Photo Eq., Optical Eq.	36,840	0.0%	84,437	0.0%	129.2%	4.5%
39	Misc Manufacturing Prods.	248,880	0.1%	444,790	0.1%	78.7%	3.1%
40	Waste or Scrap Materials	8,971,024	2.0%	18,956,946	3.5%	111.3%	4.0%
41	Misc Freight Shipments	659,079	0.1%	1,257,442	0.2%	90.8%	3.5%
42	Shipping Containers	1,157,192	0.3%	2,199,959	0.4%	90.1%	3.4%
43	Mail or Contract Traffic	16,160	0.0%	12,016	0.0%	-25.6%	-1.5%
44	Freight Forwarder Traffic	1,964,880	0.4%	3,788,837	0.7%	92.8%	3.5%
45	Shipper Association Traffic	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
46	Misc Mixed Shipments	37,182,856	8.1%	64,604,197	11.9%	73.7%	3.0%
47	Small Packaged Shipments	585,640	0.1%	1,127,524	0.2%	92.5%	3.5%
48	Waste	190,880	0.0%	261,035	0.0%	36.8%	1.7%
49	Hazardous Materials	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
50	Secondary Traffic	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
60	Unclassified	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
	Total	458,078,910	100.0%	545,166,049	100.0%	19.0%	0.9%

Source: prepared by CDM Smith, based on TRANSEARCH® data for 2011 and 2030

Appendix A: Attachments A-D

Table 42: Port Forecast Growth in Tons, 2011 to 2030

STCC2	Commodity	2011		2030		Percent Change	
		Amount	Percent	Amount	Percent	Total	CAGR
01	Farm Prods.	10,843,173	21.7%	11,079,327	17.5%	2.2%	0.1%
08	Forest Prods.	3,359	0.0%	6,503	0.0%	93.6%	3.5%
09	Fresh Fish or Marine Prods.	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
10	Metallic Ores	710,217	1.4%	600,930	1.0%	-15.4%	-0.9%
11	Coal	12,631,206	25.3%	10,910,523	17.2%	-13.6%	-0.8%
13	Crude Petrol. or Natural Gas	1,011,318	2.0%	2,528,825	4.0%	150.1%	4.9%
14	Nonmetallic Minerals	8,762,034	17.6%	14,674,855	23.2%	67.5%	2.8%
19	Ordnance or Accessories	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
20	Food or Kindred Prods.	1,697,605	3.4%	1,977,799	3.1%	16.5%	0.8%
21	Tobacco Prods.	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
22	Textile Mill Prods.	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
23	Apparel or Related Prods.	212	0.0%	149	0.0%	-29.9%	-1.8%
24	Lumber or Wood Prods.	335,292	0.7%	1,081,189	1.7%	222.5%	6.4%
25	Furniture or Fixtures	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
26	Pulp, Paper or Allied Prods.	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
27	Printed Matter	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
28	Chemicals or Allied Prods.	4,607,987	9.2%	4,910,317	7.8%	6.6%	0.3%
29	Petroleum or Coal Prods.	4,218,825	8.5%	3,857,417	6.1%	-8.6%	-0.5%
30	Rubber or Misc Plastics	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
31	Leather or Leather Prods.	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
32	Clay, Concrete, Glass, or Stone	4,275,552	8.6%	10,496,973	16.6%	145.5%	4.8%
33	Primary Metal Prods.	265,147	0.5%	564,618	0.9%	112.9%	4.1%
34	Fabricated Metal Prods.	61,674	0.1%	155,526	0.2%	152.2%	5.0%
35	Machinery	6,881	0.0%	8,231	0.0%	19.6%	0.9%
36	Electrical Equipment	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
37	Transportation Equipment	1,996	0.0%	631	0.0%	-68.4%	-5.9%
38	Instrum., Photo Eq., Optical Eq.	919	0.0%	1,160	0.0%	26.3%	1.2%
39	Misc Manufacturing Prods.	1,417	0.0%	1,085	0.0%	-23.4%	-1.4%
40	Waste or Scrap Materials	423,869	0.9%	398,802	0.6%	-5.9%	-0.3%
41	Misc Freight Shipments	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
42	Shipping Containers	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
43	Mail or Contract Traffic	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
44	Freight Forwarder Traffic	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
45	Shipper Association Traffic	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
46	Misc Mixed Shipments	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
47	Small Packaged Shipments	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
48	Waste	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
49	Hazardous Materials	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
50	Secondary Traffic	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
60	Unclassified	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
	Total	49,858,684	100.0%	63,254,857	100.0%	26.9%	1.3%

Source: prepared by CDM Smith, based on TRANSEARCH® data for 2011 and 2030

Appendix A: Attachments A-D

Table 43: Air Forecast Growth in Tons, 2011 to 2030

STCC2	Commodity	2011		2030		Percent Change	
		Amount	Percent	Amount	Percent	Total	CAGR
01	Farm Prods.	4	0.0%	5	0.0%	41.2%	1.8%
08	Forest Prods.	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
09	Fresh Fish or Marine Prods.	1,410	1.9%	1,882	1.4%	33.5%	1.5%
10	Metallic Ores	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
11	Coal	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
13	Crude Petrol. or Natural Gas	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
14	Nonmetallic Minerals	149	0.2%	204	0.1%	37.4%	1.7%
19	Ordnance or Accessories	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
20	Food or Kindred Prods.	1,020	1.4%	1,440	1.0%	41.2%	1.8%
21	Tobacco Prods.	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
22	Textile Mill Prods.	13,591	18.6%	30,213	21.7%	122.3%	4.3%
23	Apparel or Related Prods.	1	0.0%	2	0.0%	222.3%	6.4%
24	Lumber or Wood Prods.	3	0.0%	8	0.0%	155.1%	5.1%
25	Furniture or Fixtures	83	0.1%	54	0.0%	-34.5%	-2.2%
26	Pulp, Paper or Allied Prods.	905	1.2%	1,291	0.9%	42.7%	1.9%
27	Printed Matter	7,388	10.1%	6,701	4.8%	-9.3%	-0.5%
28	Chemicals or Allied Prods.	4,539	6.2%	8,961	6.4%	97.4%	3.6%
29	Petroleum or Coal Prods.	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
30	Rubber or Misc Plastics	1,156	1.6%	1,919	1.4%	66.0%	2.7%
31	Leather or Leather Prods.	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
32	Clay, Concrete, Glass, or Stone	5	0.0%	10	0.0%	117.6%	4.2%
33	Primary Metal Prods.	130	0.2%	159	0.1%	22.6%	1.1%
34	Fabricated Metal Prods.	2,231	3.1%	2,709	1.9%	21.5%	1.0%
35	Machinery	4,027	5.5%	5,726	4.1%	42.2%	1.9%
36	Electrical Equipment	9,351	12.8%	29,156	20.9%	211.8%	6.2%
37	Transportation Equipment	9,862	13.5%	13,842	9.9%	40.4%	1.8%
38	Instrum., Photo Eq., Optical Eq.	3,879	5.3%	9,912	7.1%	155.5%	5.1%
39	Misc Manufacturing Prods.	6,669	9.1%	19,563	14.0%	193.3%	5.8%
40	Waste or Scrap Materials	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
41	Misc Freight Shipments	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
42	Shipping Containers	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
43	Mail or Contract Traffic	5,356	7.3%	3,601	2.6%	-32.8%	-2.1%
44	Freight Forwarder Traffic	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
45	Shipper Association Traffic	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
46	Misc Mixed Shipments	1,245	1.7%	1,934	1.4%	55.3%	2.3%
47	Small Packaged Shipments	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
48	Waste	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
49	Hazardous Materials	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
50	Secondary Traffic	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
60	Unclassified	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
	Total	73,003	100.0%	139,296	100.0%	90.8%	3.5%

Source: prepared by CDM Smith, based on TRANSEARCH® data for 2011 and 2030

Appendix A: Attachments A-D

Table 44: Pipeline Forecast Growth in Tons, 2011 to 2030

STCC2	Commodity	2011		2030		Percent Change	
		Amount	Percent	Amount	Percent	Total	CAGR
01	Farm Prods.	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
08	Forest Prods.	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
09	Fresh Fish or Marine Prods.	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
10	Metallic Ores	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
11	Coal	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
13	Crude Petrol. or Natural Gas	8,343,709	100.0%	8,888,178	100.0%	6.5%	0.3%
14	Nonmetallic Minerals	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
19	Ordnance or Accessories	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
20	Food or Kindred Prods.	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
21	Tobacco Prods.	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
22	Textile Mill Prods.	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
23	Apparel or Related Prods.	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
24	Lumber or Wood Prods.	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
25	Furniture or Fixtures	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
26	Pulp, Paper or Allied Prods.	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
27	Printed Matter	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
28	Chemicals or Allied Prods.	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
29	Petroleum or Coal Prods.	1,376	0.0%	2,086	0.0%	51.6%	2.2%
30	Rubber or Misc Plastics	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
31	Leather or Leather Prods.	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
32	Clay, Concrete, Glass, or Stone	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
33	Primary Metal Prods.	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
34	Fabricated Metal Prods.	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
35	Machinery	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
36	Electrical Equipment	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
37	Transportation Equipment	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
38	Instrum., Photo Eq., Optical Eq.	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
39	Misc Manufacturing Prods.	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
40	Waste or Scrap Materials	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
41	Misc Freight Shipments	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
42	Shipping Containers	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
43	Mail or Contract Traffic	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
44	Freight Forwarder Traffic	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
45	Shipper Association Traffic	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
46	Misc Mixed Shipments	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
47	Small Packaged Shipments	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
48	Waste	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
49	Hazardous Materials	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
50	Secondary Traffic	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
60	Unclassified	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
Total		8,345,085	100.0%	8,890,264	100.0%	6.5%	0.3%

Source: prepared by CDM Smith, based on TRANSEARCH® data for 2011 and 2030

Appendix B

Trends, Needs, and Issues

Appendix B: Trends, Needs, and Issues

Introduction

This technical memorandum explores trends and needs impacting the freight system in Missouri.

As Missouri's population and demand for goods continue to increase, the transportation of products into the state will increase. Likewise, the production of goods within the State will continue to be demanded by people in other states requiring goods to be transported out of or within Missouri. As a result, the freight transportation system (whether highway, rail, water, air and pipeline) will be expected to keep up with the increase in freight traffic. In order to do this, the freight systems will need to be maintained and potentially expanded to meet the growing demand.

All modes of freight transportation—highway, rail, air, water, and pipeline—were considered in identifying trends and issues. The discussion encompasses which freight commodities are increasing or decreasing in, out, through, and within Missouri and which mode those commodities are anticipated to use.

Information from a number of sources was gathered to identify needs and issues including: MoDOT's recently completed Long Range Transportation Plan, regional freight plans, stakeholder input, freight transportation system assets inventory and assessment, and analysis of the conditions and performance of the State's freight system.

Trends and Issues

This section identifies and explores significant trends and issues impacting the freight system in Missouri today and in the future.

Freight movement provides many economic benefits to Missouri ranging from the outbound shipment of agricultural products and the inbound shipment of manufacturing parts, to finished products shipped both into and out of the State, to consumer goods used every day by Missouri families. The economic vitality of the State relies on transportation of goods into, out of, within and to a lesser extent through Missouri to support jobs and growth.

Freight Transportation Assets

Appendix A, Assets and Freight Flow Technical Memorandum, documents the transportation assets by which freight travels within, in, out, and through Missouri. The goal of the assets inventory was to identify the freight assets utilized and projected to be utilized within Missouri, so MoDOT can verify the capabilities of their freight infrastructure. The objective of the analysis is ultimately to identify freight system needs, potential capital improvements, and policy options to maintain and improve operations of the system. The inventory is discussed based on the modes by which freight travels in Missouri, as well as intermodal facilities and freight generators. Additional information on Missouri's freight assets is located in Appendix A.

Highway

Missouri has the seventh largest state highway system in the United States. It is made up of 33,700 centerline miles of roadway and over 10,000 bridges, 5,500 miles of which are classified as heavily traveled "major highways" and 28,200 miles of which are defined as lesser traveled "minor highways". Missouri's major highways encompass just 20 percent of the State's highway miles but carry 80 percent of the system's traffic.

Rail

The state of Missouri has a significant freight rail infrastructure with six Class I freight railroads currently operating 4,200 miles of main track rail lines, 2,500 yard track miles, and 5,700 public and private rail-highway crossings within the State. There are no Class II railroads operating in Missouri; however, there are five short line railroads that serve Missouri. A railroad with operating revenues greater than \$433.2 million¹ for at least three consecutive years is considered a Class I railroad. Similarly, a railroad with revenues greater than \$34.7 million², but less than \$433.2 million³, is considered a Class II railroad; such railroads are commonly referred to as "regional" railroads. A railroad not within the Class I or II categories is considered a Class III railroad, also known as a "short line."

¹ http://www.aslrra.org/about_aslrra/faqs/

² http://www.aslrra.org/about_aslrra/faqs/

³ http://www.aslrra.org/about_aslrra/faqs/

Appendix B: Trends, Needs, and Issues

Water

Missouri contains 1,050 miles of navigable rivers, including 500 miles of the Mississippi River and 550 miles of the Missouri River. A total of 14 public ports and over 200 private ports can be found along Missouri's waterways. Three public ports and over 50 private ports operate along the Missouri River; 11 public port authorities and over 150 private ports operate on the Mississippi River.

Air

Missouri is home to three of the top 106 cargo airports in North America in terms of total tonnage in 2012; these are Kansas City International Airport (MCI), Lambert-St. Louis International Airport (STL), and Springfield-Branson National Airport (SGF).

Pipeline

Approximately 10,700 miles of pipelines move natural gas, crude oil, and petroleum products throughout Missouri.

Intermodal Facilities

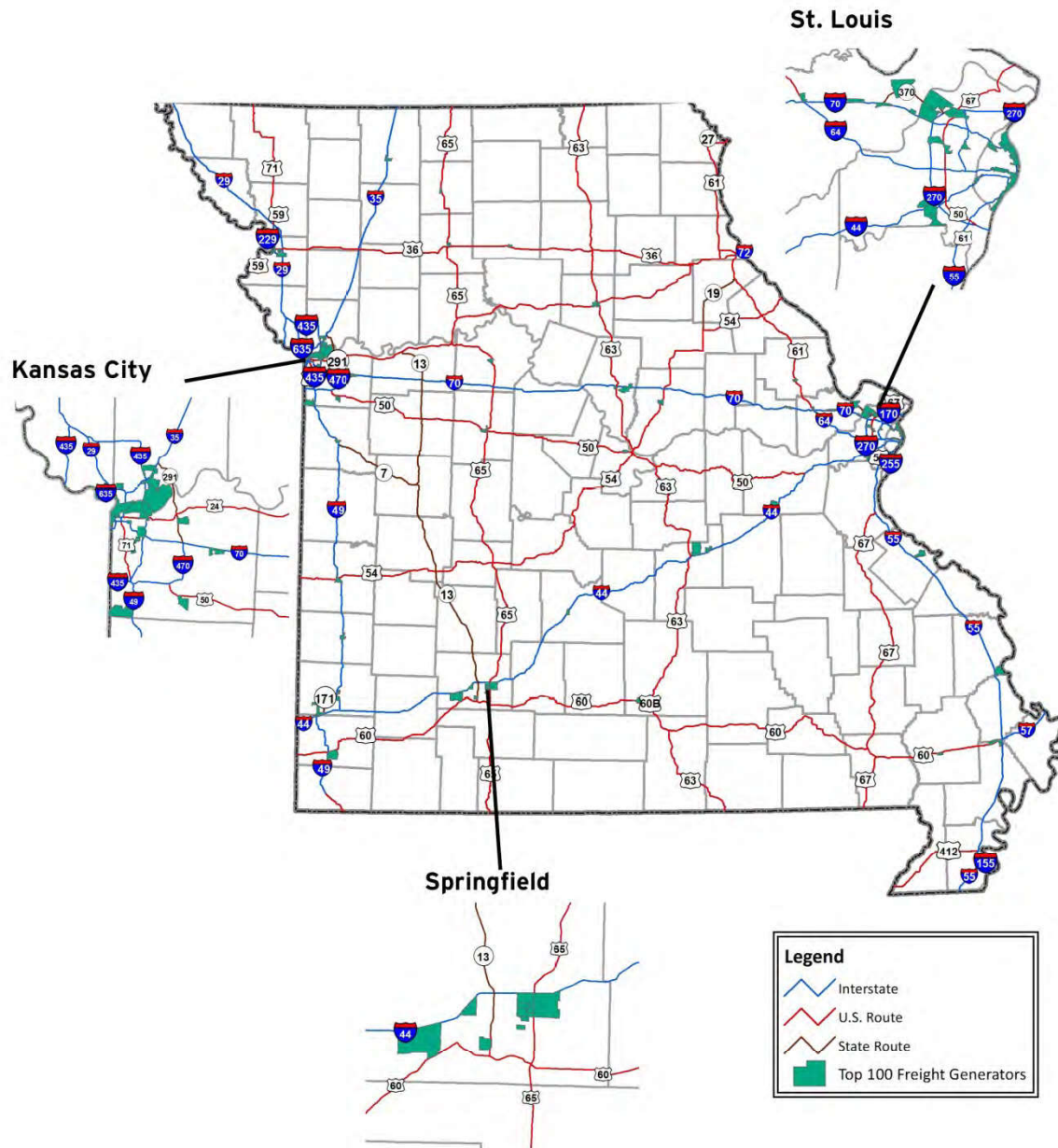
The National Transportation Atlas Data available through the Bureau of Transportation Statistics identified 115 intermodal facilities located in Missouri that provide a variety of intermodal interactions. The majority of the intermodal facilities (71%) accommodate rail - truck commodity transfers followed by modal transfers at ports (16%) and airports (8%).

Freight Generators

An analysis using GPS truck data and GIS data layers identified the top 100 most intense freight generators in Missouri. **Figure B-1** shows the location of these freight generators.

Appendix B: Trends, Needs, and Issues

Figure B-1: 100 Identified Freight Generators: Census Block Groups



Source: ATRI

Appendix B: Trends, Needs, and Issues

Condition and Performance of Freight System

Knowledge of the condition and the resulting performance of freight transport on the existing infrastructure serves to identify and aid in prioritizing freight system improvements. Appendix A also discussed the condition and performance of the highway and rail modes of freight transportation.

Condition

There are a total of 73 low vertical clearance bridges in Missouri. This represents less than one percent of all bridges owned by MoDOT. Five (four percent) of these bridges cross Interstates and 12 (nine percent) cross U.S. Highways.

In addition, to the low clearance bridges there are 4,849 load-restricted bridges in Missouri. This is about 20 percent of all bridges owned by MoDOT. One hundred thirty-five (three percent) of these bridges cross Interstates and 81 (two percent) cross U.S. Highways.

Performance

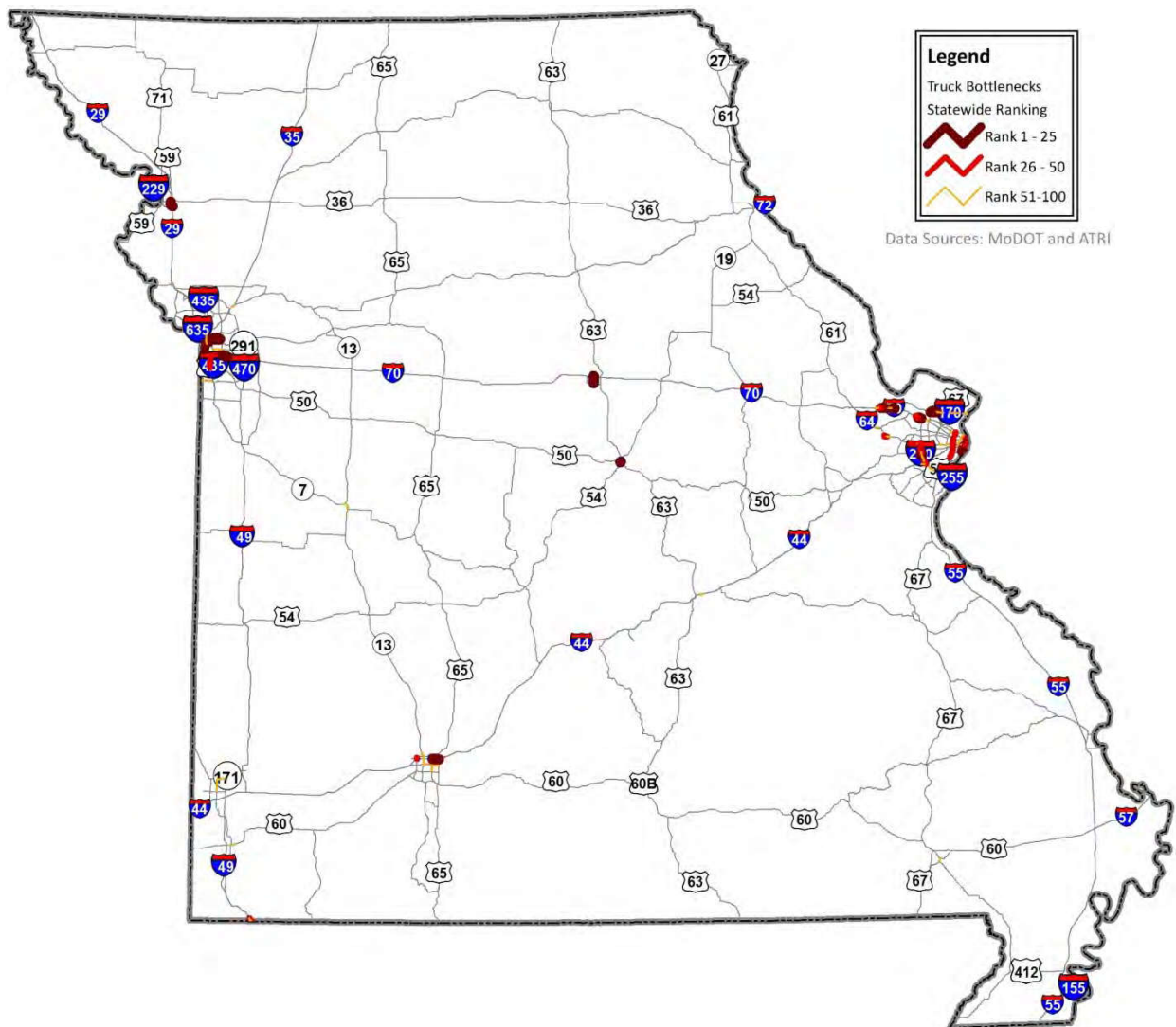
An analysis was completed to identify both highway and rail bottlenecks in the State. ATRI's (American Transportation Research Institute) Freight Performance Measures (FPM) database compiles anonymous trucking operations data from several hundred thousand trucks using Global Positioning System (GPS) data from onboard trucking systems -- generating billions of data points annually. The truck GPS data generated an average speed and numerous position counts for every hour of the day across 3,311 roadway segments where trucks equipped with the GPS units traveled. The segment speed differences were calculated through extensive analysis between the difference in peak travel times in the morning, mid-day and evening, compared to the off-peak travel times. These times were multiplied by the per-mile truck data sample size for that period. The values for the three periods were added together to generate the total congestion index.

The 100 segments with the highest congestion indices were isolated for further analysis as the top trucking bottlenecks in Missouri. St. Louis and Kansas City contained 81 out of the state's 100 worst truck bottlenecks; however, Springfield also contained several bottlenecks, with several more locations dispersed throughout cities and towns across the State **Figures B-2 and B-3** presents the 100 segments identified as bottlenecks through this analysis.

The rail bottlenecks analysis was completed using the Association of American Railroads' methodology for determining the level of service for a specific freight rail corridor. **Figure B-4** illustrates the volume-to-capacity ratio and the maximum number of trains per day for each freight rail corridor in Missouri.

Appendix B: Trends, Needs, and Issues

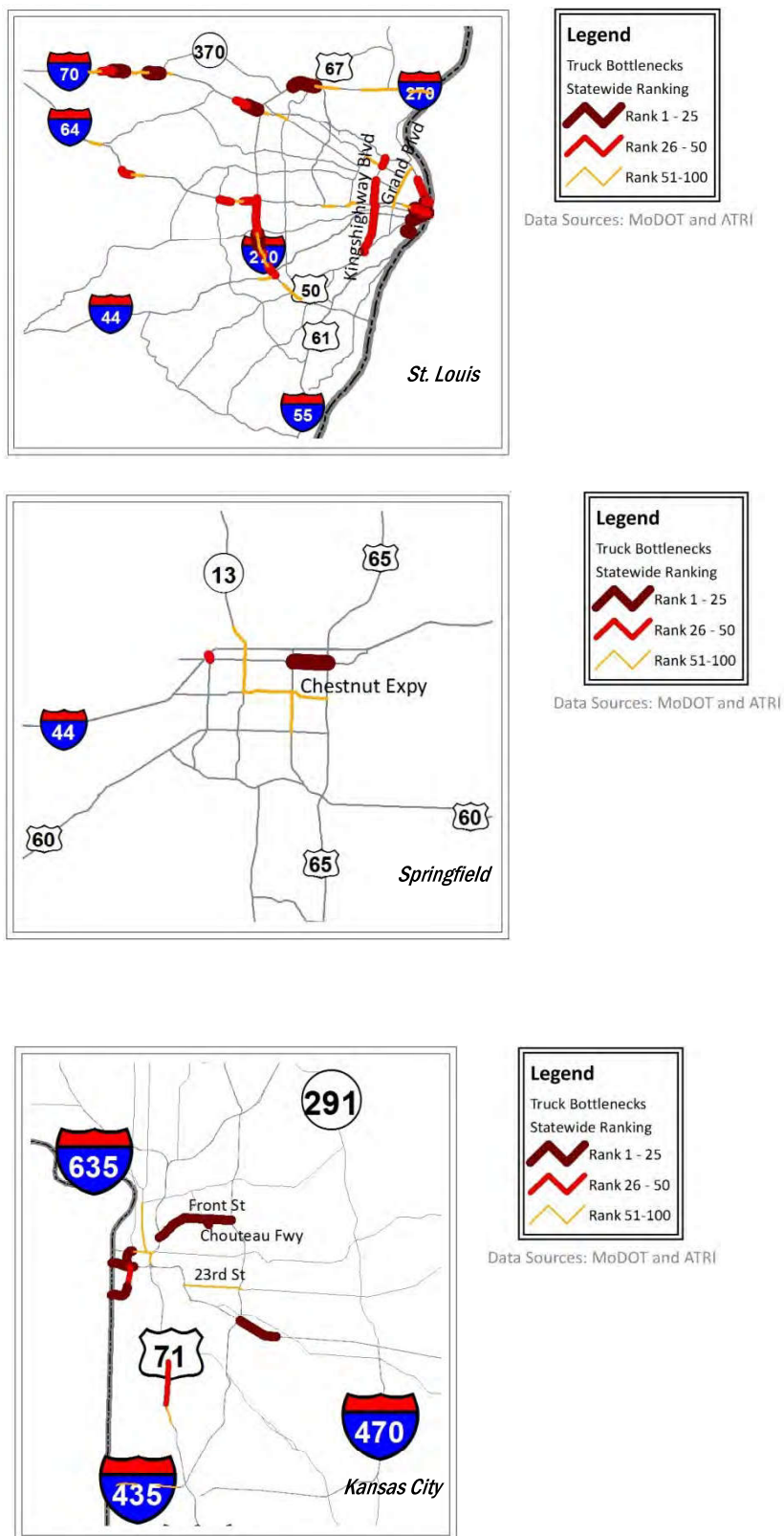
Figure B-2: Top 100 Truck Bottlenecks in Missouri



Source: CDM Smith, ATRI, ESRI

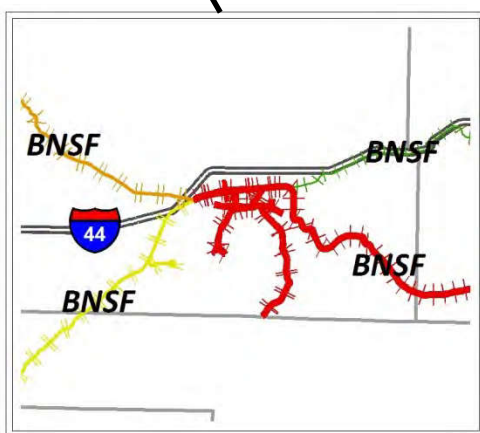
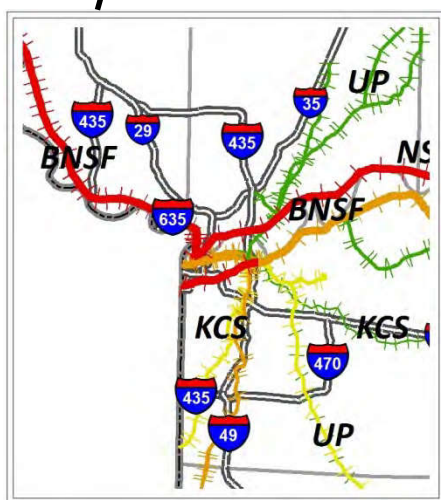
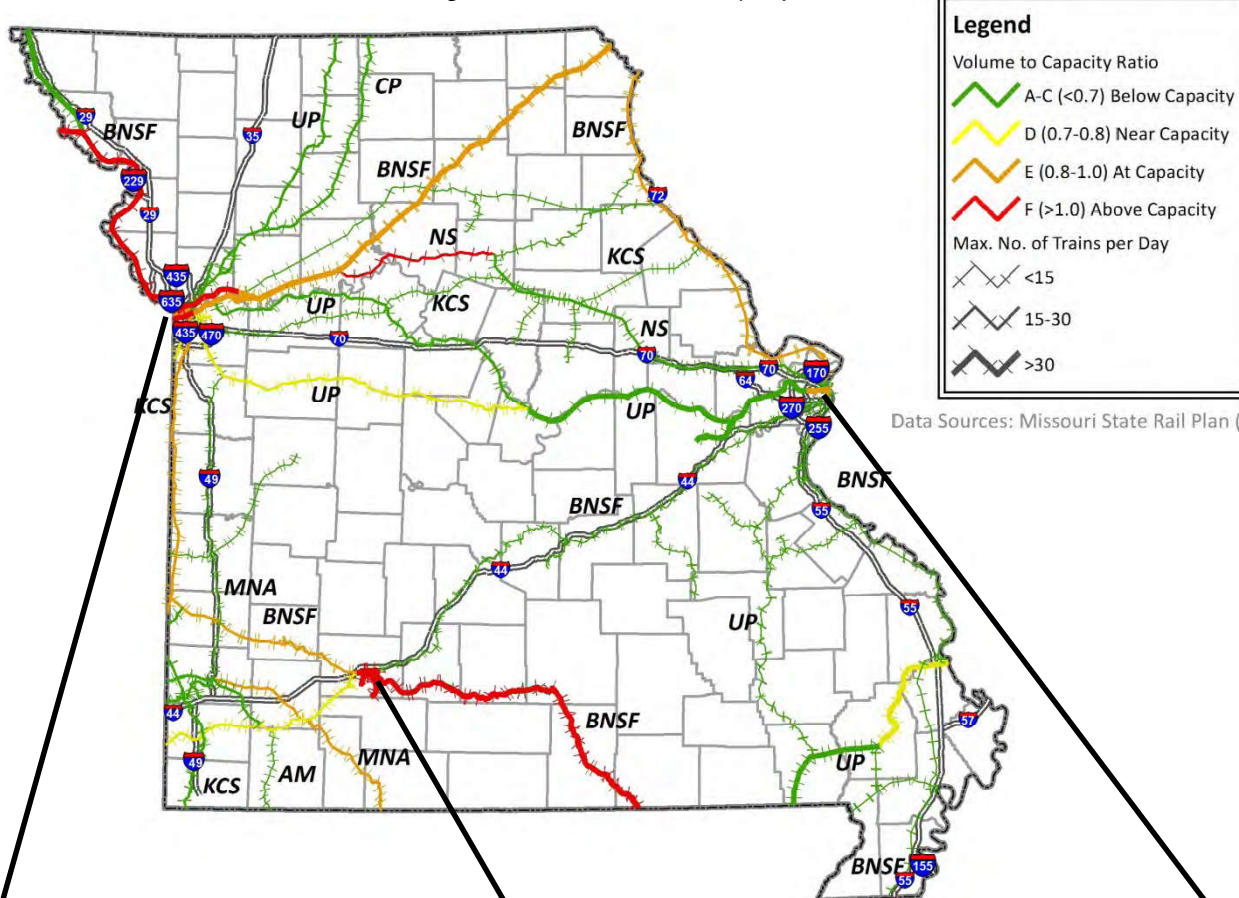
Appendix B: Trends, Needs, and Issues

Figure B-3: Regional Truck Bottlenecks



Appendix B: Trends, Needs, and Issues

Figure B 4: Rail Corridor Volume Capacity



Appendix B: Trends, Needs, and Issues

Economics

Freight Commodity Growth

The analysis of the type of freight commodities, a commodity's tonnage, a commodity's dollar value and the directional movement (into, out of, within or through Missouri) being transported help illustrate the importance of freight movements to Missouri from different perspectives. Each of these perspectives assists in estimating the economic impacts of freight movement.

Directional Movement – Directional freight movements impact Missouri differently.

- Inbound commodities from out-of-State comprise two basic types: final goods and intermediate production materials (inputs). Final goods typically go directly to consumers or to retail outlets; hence, associated economic impacts are, at most, a function of retail price markups. Comparatively, economic impacts associated with inbound materials used in Missouri manufacturing processes can be quite significant.
- Outbound commodities from Missouri to other states also represent the result of value-added Missouri production. Additionally, intrastate Missouri movements represent both value-added Missouri production and/or retail price markups.
- Freight movements through Missouri generate little, if any, economic value to the State (i.e., transport service only). Nonetheless, the magnitude of through truck and rail volumes is important in a freight plan given the effect on modal infrastructure capacity.

Commodity Tonnage and Value – While it is important to understand tonnage movements, such observations do not unilaterally address the importance of freight movements to Missouri (other considerations matter such as value, direction, mode, etc.). Top commodity tonnages (via all modes and directions, combined) are led by Coal (237.6 million, 23.4%), followed by Farm Products (129.2 million, 12.7%), and Nonmetallic Minerals (such as limestone, sand, clay and granite) (123.7 million, 12.2%); see **Table B-1**. Comparatively, the top commodity value movements (via all modes and directions, combined) are led by Miscellaneous Mixed Shipments (\$189.3 billion, 15.7%), followed by Transportation Equipment (\$163.7 billion, 13.6%), and Secondary Traffic (is common with distribution centers when products A, B, and C arrive for storage and is considered secondary traffic when the product leaves the distribution center to a retail outlet or home delivery) (\$161.7 billion, 13.4%), see **Table B-2**.

Since 2011, there are two key shifts impacting commodity movement in Missouri. First is the increase movement of crude oil by rail in Missouri and second is sand produced in eastern Missouri as a valuable input to the oil extracting process known as fracking.

The rapid increase in crude oil from the Bakken region strained existing pipeline capacities and oil refiners. As a result, between 2011 and 2012 crude oil transported by rail has increased 423 percent. With limited available oil rail cars, it is extremely important to have a quick delivery and return to the Bakken oil fields. One solution is to transfer the rail oil tankers to barges for their last leg to oil refineries. There are two Missouri locations with such capability in St. Louis and Hayti, Missouri.

The St. Peter Sandstone formation mined in eastern Missouri has two unique characteristics – it is nearly pure silica and the grains are almost spherical. These features are unique and work exceptionally well in oil fracking which has led this type of sand to be called fracking sand. As a result, the silica sand is in high demand in North Dakota and Texas. There are four quarries in eastern Missouri where the silica sand is mined. Silica sand is typically transported by rail or barge.

Appendix B: Trends, Needs, and Issues

Table B-1: Top Commodities By Tonnage, 2011

STCC2	Commodity	Tons (in thousands)	
		Amount	Percent
11	Coal	237,585	23.4%
01	Farm Products	129,200	12.7%
14	Nonmetallic Minerals	123,662	12.2%
20	Food or Kindred Products*	98,474	9.7%
28	Chemicals or Allied Products	84,647	8.3%
50	Secondary Traffic	83,952	8.3%
29	Petroleum or Coal Products	47,132	4.6%
46	Misc Mixed Shipments	37,592	3.7%
32	Clay, Concrete, Glass or Stone	31,538	3.1%
37	Transportation Equipment	19,410	1.9%
	Remaining Commodities	123,557	12.2%
	Total	1,016,748	100.0%

*kindred products includes manufactured or processed foods for human consumption such as manufactured ice, chewing gum and animal or vegetable cooking oils and fats.

Source: TRANSEARCH® data for 2011

Table B 2: Top Commodities By Value, 2011

STCC2	Commodity	Value (in millions)	
		Amount	Percent
46	Misc Mixed Shipments	\$189,344	15.7%
37	Transportation Equipment	\$163,658	13.6%
50	Secondary Traffic	\$161,694	13.4%
28	Chemicals or Allied Products	\$134,438	11.2%
20	Food or Kindred Products	\$99,907	8.3%
01	Farm Products	\$57,608	4.8%
35	Machinery	\$57,147	4.7%
36	Electrical Equipment	\$54,732	4.5%
33	Primary Metal Products	\$50,411	4.2%
29	Petroleum or Coal Products	\$42,095	3.5%
	Remaining Commodities	\$194,573	16.1%
	Total	\$1,205,607	100.0%

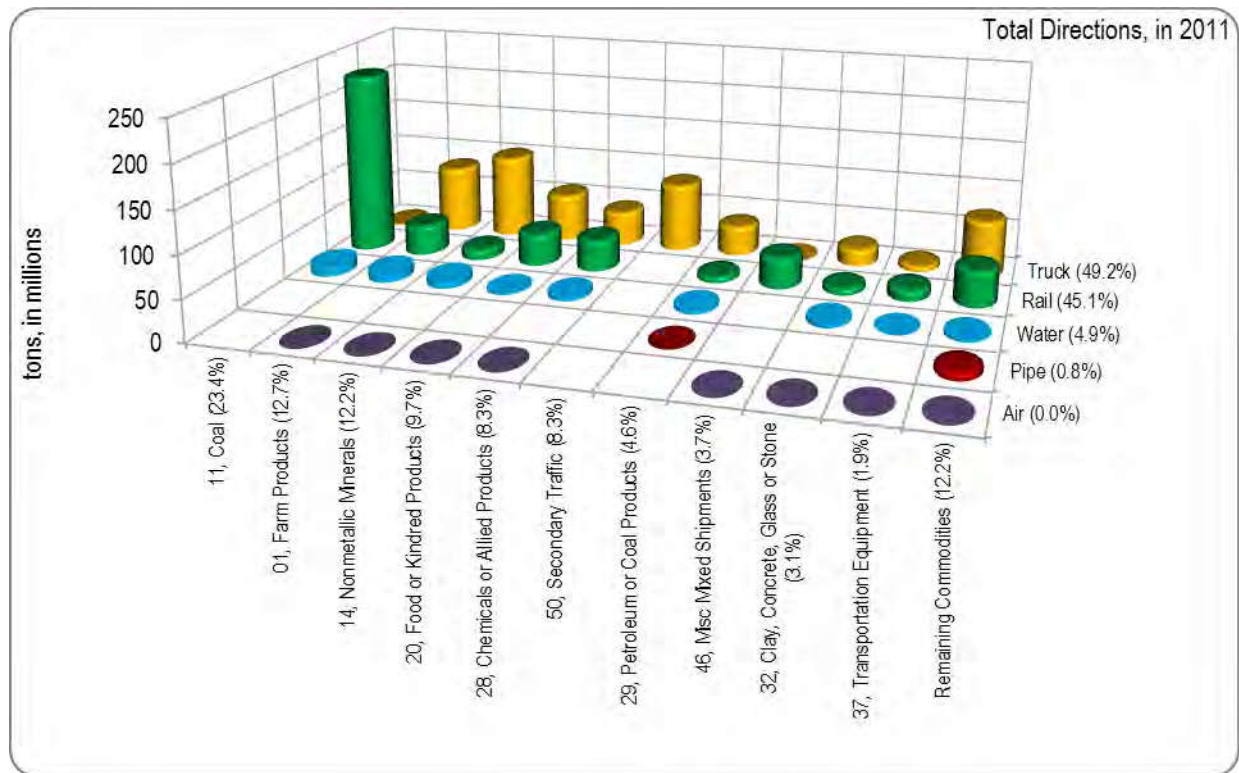
Source: TRANSEARCH® data for 2011

Commodity Tons by Mode - Figure B-5 illustrates modal differences by commodity tonnage. Truck leads most commodity ton movements, especially Farm Products, Nonmetallic Minerals, and Secondary Traffic, as well as other Remaining Commodities; however, rail-based Coal is by far the largest single commodity movement. Port, air, and pipeline commodity ton movements are all dwarfed by truck and rail.

Commodity Value by Mode - Figure B-6 shows modal differences by commodity value, as compared to the ton volumes. A similar pattern is observed, with truck-based commodity movement generally exceeding all other modes, especially, Food and Kindred Products, Farm Products, Secondary Traffic, and other Remaining Commodities. However, rail-based Miscellaneous Mixed Shipments are the largest movement by value, and rail-based Transportation Equipment movement value exceeds truck. Similarly to tonnage movements, the port, air, and pipeline value movements are all insignificant compared to either truck or rail.

Appendix B: Trends, Needs, and Issues

Figure B-5: Top Commodities by Tonnage and Mode, 2011

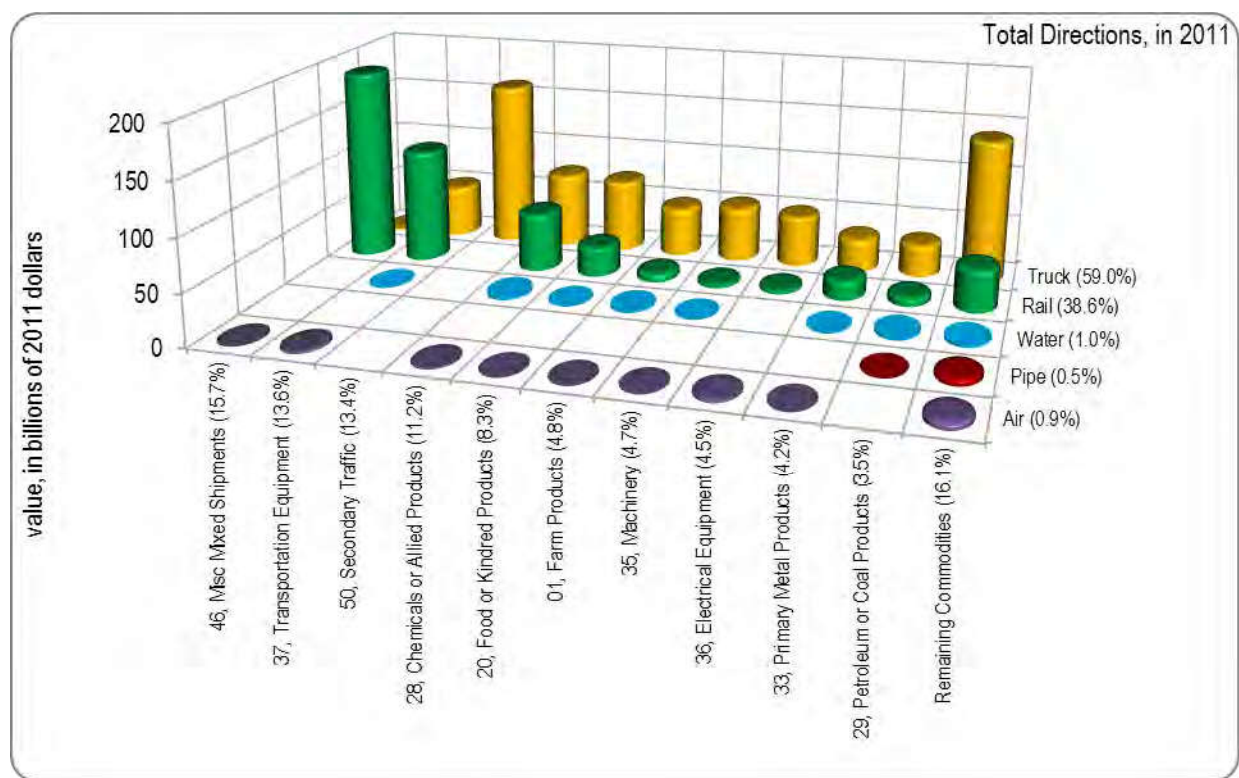


Source: TRANSEARCH® data for 2011

Reliance on the highway and rail systems will continue into the future as the primary freight modes in Missouri. Missouri is and will continue to accommodate a large percentage of through freight movements which places a strain on the Missouri system due to maintenance requirements from the freight passing through the State.

Appendix B: Trends, Needs, and Issues

Figure B-6: Top Commodities by Value and Mode, 2011



Source: TRANSEARCH® data for 2011

Freight tonnage across the Missouri freight network is forecast to grow 37.3 percent from 2011 to 2030 (1.7 percent annually). Truck and rail are by far the dominant modes of freight transportation in Missouri. Truck movements account for 49 percent of the total tonnage and rail movements account for 45 percent. Truck growth is forecast to grow by 55.5 percent (2.4 percent annually), from 500.4 million tons in 2011 to 778.1 million in 2030, a 277.7 million ton increase. In the context of the aggregate 378.8 million ton growth forecast for all combined modes, this 277.7 million increase in truck constitutes 73.3 percent, about half of which is attributable to through movements. While rail growth is forecast to grow by 19 percent (0.9 percent annually), from 458.1 million tons in 2011 to 545.2 million tons in 2030, it still constitutes 40 percent of the total tonnage moved through Missouri. Additional details are available in Appendix A.

Appendix B: Trends, Needs, and Issues

Truck Forecast

Table B-3 depicts the directional composition of truck movements in Missouri between 2011 and 2030, which is relatively constant over the future analysis horizon. Truck tonnage is forecast to increase from 500.4 million in 2011 to 778.1 million in 2030, a cumulative increase of 55.5% (2.4% annually). Truck commodity value is forecast to increase from \$710.9 billion in 2011 to \$1.20 trillion by 2030, a cumulative increase of 68.4% (2.8% annually). Truck freight density growth across the Missouri road network is shown in **Figure B-7**, which indicates the greatest volume increases on I-44 and I-55.

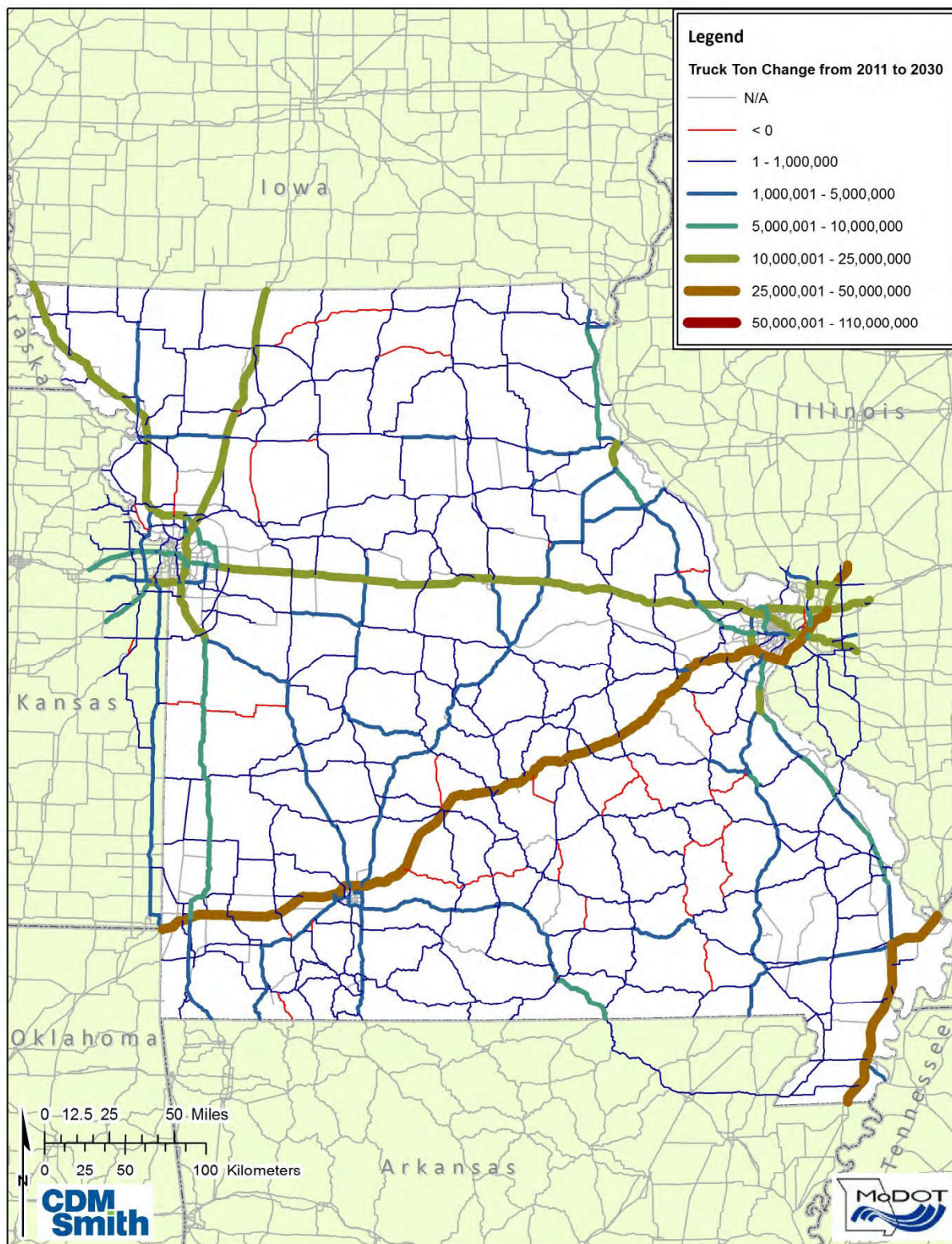
Table B-3: Truck Forecast by Direction, 2011 to 2030

Direction	2011		2030		Percent Change	
	Amount	Percent	Amount	Percent	Total	CAGR
Tons						
Outbound	75,301,621	15.0%	108,430,027	13.9%	44.0%	1.9%
Inbound	89,250,507	17.8%	129,095,659	16.6%	44.6%	2.0%
Intra	105,627,915	21.1%	182,656,763	23.5%	72.9%	2.9%
Through	230,212,488	46.0%	357,953,967	46.0%	55.5%	2.4%
Total	500,392,531	100.0%	778,136,417	100.0%	55.5%	2.4%
Value, in millions						
Outbound	\$95,005	13.4%	\$139,161	11.6%	46.5%	2.0%
Inbound	\$119,731	16.8%	\$194,892	16.3%	62.8%	2.6%
Intra	\$62,346	8.8%	\$78,333	6.5%	25.6%	1.2%
Through	\$433,794	61.0%	\$784,501	65.5%	80.8%	3.2%
Total	\$710,876	100.0%	\$1,196,888	100.0%	68.4%	2.8%

Source: TRANSEARCH® data for 2011

Appendix B: Trends, Needs, and Issues

Figure B-7: Truck Ton Growth, 2011 to 2030



Source: TRANSEARCH® data for 2011

Appendix B: Trends, Needs, and Issues

By 2030, the Missouri highway freight system is projected to support more than 63.2 million truck trips which will total over of 778.1 million tons and be valued at \$1.20 trillion with an average value/ton of \$1,538. The top five truck commodities by tonnage, units, value and growth can be reviewed in Appendix A.

Rail Forecast

Table B-4 depicts the directional composition of rail movements in Missouri between 2011 and 2030, which is relatively constant over the future analysis horizon. Rail tonnage is forecast to increase from 458.1 million in 2011 to 545.2 million in 2030, a cumulative increase of 19.0% (0.9% annually). Rail commodity value is forecast to increase from \$465.0 billion in 2011 to \$790.6 billion by 2030, a cumulative increase of 70.0% (2.8% annually). Note that inbound tonnage is forecast to decline.

Freight density growth across the Missouri rail network is shown in **Figure B-8**, which indicates the greatest rail volume increases on the BNSF line connecting Kansas City and Chicago.

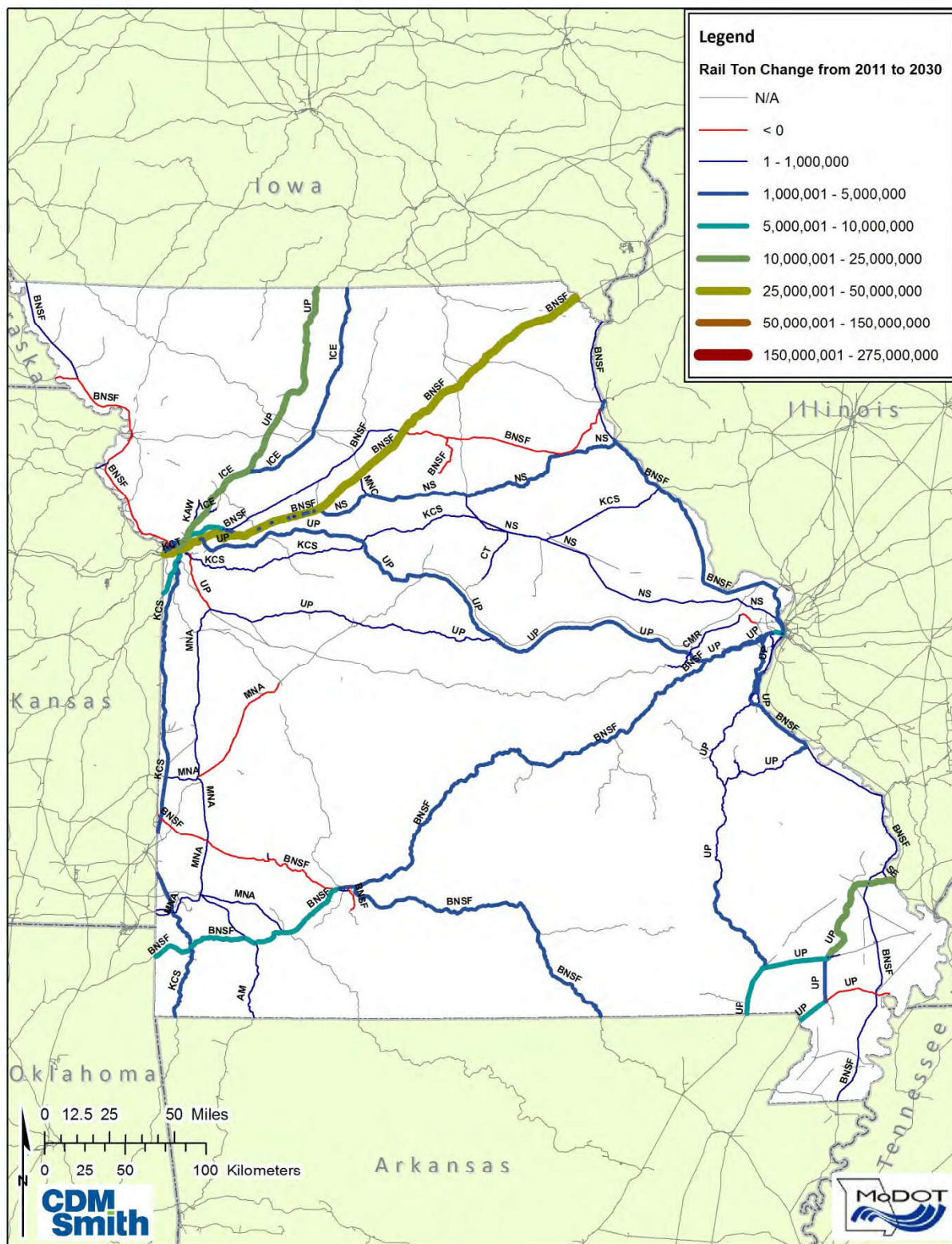
Table 4: Rail Forecast by Direction, 2011 to 2030

Direction	2011		2030		Percent Change	
	Amount	Percent	Amount	Percent	Total	CAGR
Tons						
Outbound	21,510,433	4.7%	35,366,325	6.5%	64.4%	2.7%
Inbound	92,326,793	20.2%	90,178,404	16.5%	-2.3%	-0.1%
Intra	2,436,087	0.5%	3,237,194	0.6%	32.9%	1.5%
Through	341,805,597	74.6%	416,384,127	76.4%	21.8%	1.0%
Total	458,078,910	100.0%	545,166,049	100.0%	19.0%	0.9%
Value, in millions						
Outbound	\$40,364	8.7%	\$67,228	8.5%	66.6%	2.7%
Inbound	\$39,647	8.5%	\$64,535	8.2%	62.8%	2.6%
Intra	\$1,616	0.3%	\$3,393	0.4%	110.0%	4.0%
Through	\$383,409	82.4%	\$655,439	82.9%	71.0%	2.9%
Total	\$465,035	100.0%	\$790,595	100.0%	70.0%	2.8%

Source: TRANSEARCH® data for 2011

Appendix B: Trends, Needs, and Issues

Figure B-8: Rail Ton Growth, 2011 to 2030



Source: TRANSEARCH® data for 2011

Appendix B: Trends, Needs, and Issues

The anticipated rail movement in Missouri is expected to total 545.2 million tons, carried via 12.0 million rail cars, valued at \$790.6 billion in 2011 with an average value/ton of \$1,450. The top five rail commodities by tonnage, units, value and growth can be reviewed in Appendix A.

Port Forecast

Table B-5 depicts the projected directional composition of public port movements in Missouri between 2011 and 2030, which is relatively constant over the future analysis horizon; but, intrastate movements increase somewhat (albeit, continuing to be relatively insignificant compared to other directional port movements). Port tonnage is forecast to increase from 49.9 million in 2011 to 63.3 million in 2030, a cumulative increase of 26.9% (1.3% annually). Port commodity value is forecast to increase from \$12.5 billion in 2011 to \$15.4 billion by 2030, a cumulative increase of 23.1% (1.1% annually).

Table 5: Port Forecast by Direction, 2011 to 2030

Direction	2011		2030		Percent Change	
	Amount	Percent	Amount	Percent	Total	CAGR
Tons						
Outbound	19,973,291	40.1%	25,917,689	41.0%	29.8%	1.4%
Inbound	5,093,847	10.2%	5,906,771	9.3%	16.0%	0.8%
Intra	4,941,503	9.9%	9,565,245	15.1%	93.6%	3.5%
Through	19,850,043	39.8%	21,865,151	34.6%	10.2%	0.5%
Total	49,858,684	100.0%	63,254,857	100.0%	26.9%	1.3%
Value, in millions						
Outbound	\$3,479	27.7%	\$4,302	27.8%	23.6%	1.1%
Inbound	\$3,083	24.6%	\$4,060	26.3%	31.7%	1.5%
Intra	\$117	0.9%	\$253	1.6%	116.2%	4.1%
Through	\$5,870	46.8%	\$6,833	44.2%	16.4%	0.8%
Total	\$12,549	100.0%	\$15,448	100.0%	23.1%	1.1%

Source: TRANSEARCH® data for 2011

The 2030 commodity movements by port are estimated to reach 63.3 million tons, be valued at \$15.4 billion and have an average value/ton of \$244. The top five port commodities by tonnage, units, value, and growth can be reviewed in Appendix A.

Air Forecast

Table B-6 depicts the directional composition of air movements in Missouri between 2011 and 2030, which changes somewhat over the future analysis horizon; outbound movements decrease in relative proportion, while inbound movements increase. Air tonnage is forecast to increase from 73,003 in 2011 to 139,296 in 2030, a cumulative increase of 90.8% (3.5% annually). Air commodity value is forecast to increase from \$11.4 billion in 2011 to \$27.5 billion by 2030, a cumulative increase of 141.8% (4.8% annually).

Appendix B: Trends, Needs, and Issues

Table B-6: Air Forecast by Direction, 2011 to 2030

Direction	2011		2030		Percent Change	
	Amount	Percent	Amount	Percent	Total	CAGR
Tons						
Outbound	34,313	47.0%	54,382	39.0%	58.5%	2.5%
Inbound	38,249	52.4%	84,077	60.4%	119.8%	4.2%
Intra	370	0.5%	726	0.5%	96.2%	3.6%
Through	71	0.1%	112	0.1%	56.8%	2.4%
Total	73,003	100.0%	139,296	100.0%	90.8%	3.5%
Value, in millions						
Outbound	\$7,620	66.9%	\$16,592	60.3%	117.7%	4.2%
Inbound	\$3,656	32.1%	\$10,681	38.8%	192.1%	5.8%
Intra	\$100	0.9%	\$245	0.9%	144.5%	4.8%
Through	\$10	0.1%	\$16	0.1%	65.2%	2.7%
Total	\$11,387	100.0%	\$27,534	100.0%	141.8%	4.8%

Source: TRANSEARCH® data for 2011

The 2030 commodity movements by air are estimated to reach 139,296 tons and be valued at \$27.5 billion, with an average value/ton of \$197,667. The top five rail commodities by tonnage, units, value and growth are shown in Appendix A.

Pipeline Forecast

Table B-7 depicts the directional composition of pipeline movements in Missouri between 2011 and 2030, which remains completely constant over the future analysis horizon. Pipeline tonnage is forecast to increase from 8.3 million tons in 2011 to 8.9 million in 2030, a cumulative increase of 6.5% (0.3% annually). Pipeline commodity value is forecast to increase from \$5.8 billion in 2011 to \$6.1 billion by 2030, a cumulative increase of 6.5% (0.3% annually).

Table B-7: Pipeline Forecast by Direction, 2011 to 2030

Direction	2011		2030		Percent Change	
	Amount	Percent	Amount	Percent	Total	CAGR
Tons						
Outbound	N/A	N/A	N/A	N/A	N/A	N/A
Inbound	932,258	11.2%	993,713	11.2%	6.6%	0.3%
Intra	N/A	N/A	N/A	N/A	N/A	N/A
Through	7,412,827	88.8%	7,896,550	88.8%	6.5%	0.3%
Total	8,345,085	100.0%	8,890,264	100.0%	6.5%	0.3%
Value, in millions						
Outbound	N/A	N/A	N/A	N/A	N/A	N/A
Inbound	\$643	11.2%	\$686	11.2%	6.6%	0.3%
Intra	N/A	N/A	N/A	N/A	N/A	N/A
Through	\$5,117	88.8%	\$5,451	88.8%	6.5%	0.3%
Total	\$5,761	100.0%	\$6,137	100.0%	6.5%	0.3%

Source: TRANSEARCH® data for 2011

In Missouri, growth in pipeline movements is effectively attributable to increases in only one commodity: Crude Petroleum and Natural Gas. A majority of that tonnage and value increase will be from pipeline movements traveling through Missouri.

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Trade and Industry Growth

There is a close relationship between industrial health and vitality and available transportation options. Industries need parts and supplies to manufacture products that are then transported across the state, country, and world. In Missouri, the goods range from agricultural grains and food products to automobiles. Transportation is responsible for bringing supplies into Missouri as well as exporting the products of Missouri industries.

Nationally, continued growth in employment and investment in advanced industries is occurring. These industries include pharmaceuticals and medicine; industrial machinery; commercial and service industry machinery; engines, turbines, and power transmission equipment; communications equipment; measurement and calibration equipment; electro-medical and control instruments; aerospace products and parts; motor vehicles; and medical equipment and supplies. Advanced industries account for 11 percent of Gross Domestic Product and 80 percent of all private-sector research and development investments, as well as one-third of all U.S. exports. These industries employ over 7.4 million in the U.S. and almost half of those jobs are available to workers with less than a four-year college degree. Advanced industries rely on thousands of domestic supplier firms supporting an estimated 5.1 million additional jobs in their direct supply chains. These industries are projected to add an estimated 2 million new jobs over the next 10 years; wages in this sector are almost twice as much on average as non-advanced industry companies. Regions and states are actively recruiting firms in these sectors and providing incentives to retain these businesses. Many advanced industries are transportation-dependent. Advanced Manufacturing Industries in Missouri employed 175,396 workers in 2012 and average annual salaries were \$77,060.

Manufacturing productivity in the U.S. increased 73 percent between 1993 and 2011 according to the U.S. Department of Commerce, contributing \$1.87 trillion to the U.S. economy in 2012. More than 60 percent of U.S. exports are manufactured goods, and as new markets continue to open and global incomes continue to improve, businesses stand to achieve even greater export-related revenues and profits. Although direct manufacturing jobs have declined over the past two decades, indirect jobs in engineering, design, marketing, and finance that support manufacturing operations generate 68 cents for every dollar of manufacturing wages. Today U.S. manufacturing accounts for 20 percent of the world's manufacturing output and U.S. manufacturing value-added (for example, the increase in the value of individual auto parts versus the value of a finished vehicle) is greater than that of China, India, Brazil, and Russia combined.

Exports of aircraft have doubled since 2009, driven by demands from Asia and the Middle East, and industry experts project a significant increase in the size of global aircraft fleets by 2031 which can translate to significant business opportunities for the Missouri aerospace and aviation sector. In Missouri 14,235 are employed in aerospace products and aerospace parts manufacturing with average annual salaries of \$102,882.

The most export-dependent industries in Missouri (those industries that export 50 to 75 percent of production internationally) include: agricultural products, food, mining machinery and equipment, communication and energy wire manufacturing, chemical manufacturing, measurement and calibration equipment manufacturing.

Export industries in Missouri account for 95,000 direct jobs. The St. Louis metro area exported \$19 billion in goods and services in 2012, reflecting a 7.9 percent growth in exports from 2009 - 2012. The top three export gainers were aircraft, motor vehicles, non-ferrous metal products. The Kansas City metro area exported \$11.5 billion in goods during 2012, resulting in an 8.7 percent growth in exports from 2009 - 2012. The top three export gainers were motor vehicles, aircraft, and communications equipment.

Chemicals are Missouri's second largest international export and employ over 17,000 workers, with clusters in St. Louis and northeast and northwest Missouri. U.S. chemical companies have earmarked \$25 billion in new investments for expansion of existing facilities or construction of new facilities according to a recent study by the American Chemistry Council. Missouri may be able to benefit from these new investments. The availability of lower cost energy and feedstock from shale gas has significantly improved the outlook for chemical manufacturing, although some risks on the horizon still exist in regulatory environments, as well as supply line concerns in new growth economies.

Missouri food and food ingredient exports have increased by 148% since 2005. Top agriculture export products include soybeans, corn, cotton, pork, vegetable oils, oilcake, meal, and wheat. Major food processing companies in Missouri include: Farmland, Fricks, IDF, Russell Stover, Anheuser-Busch, Bissinger's, and McCormick Distilling. Increasing global wages have resulted in increased demand for U.S. agricultural products due to higher quality standards and variety.

The Panama Canal, originally constructed in 1914, is now undergoing a \$5.25 billion expansion to be completed in 2015. The completion of the canal opened one of the most important trade links in the world by linking the Atlantic and Pacific Oceans. When the canal expansion is complete the new locks will allow for deeper, longer and wider vessels, doubling its existing

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throughput capacity⁴. Reduction of transportation costs due to Canal expansion could affect the movement of goods on inland waterways in two ways. A reduction in ocean transportation costs out of Gulf ports due to the use of larger, more efficient ships will tend to reduce aggregate costs of exporting bulk commodities, such as grain, by the Mississippi River route rather than by rail through Pacific Northwest ports. Second, lower transportation costs attributable to expansion of the Canal could increase export volumes as the transportation element of U.S.-produced commodity costs helps to make U.S. exports more competitive in world markets. While the scale and timing of the impacts to Missouri freight flows is unknown at this time, it is anticipated that the expansion will change international trade flows and change the demands on transportation networks, service and operation.

All of these growth factors will lead to a growth in freight movements within Missouri. The growth in freight movements will result in increasing demands on the highways, rail lines, port facilities and airports handling air cargo freight.

Institutional and Regulatory Trends

Federal regulatory trends may affect Missouri freight transportation. An example would be the implications from incremental Federal regulation of trucking and trucker safety (e.g. hours of service (HOS)), electronic logging devices (ELD), compliance-safety-accountability (CSA), EPA truck engine /reefer trailer regulations) or even speculation about how truck size and weight affects trucking services pricing, trucking network operations and mode choice. These trends may increase the cost of freight movements by truck, resulting in some commodities possibly switching to a different mode. A driver shortage may increase the transport time and affect frequency of deliveries, or require distribution centers, warehouses, and stores to maintain a larger backlog of products.

Other freight-related trends might be recent public-private partnerships (P3), which involve use of private capital for transportation infrastructure projects. In these cases, availability payment mechanisms are becoming more preferred on the part of investors compared with earlier pure operating concession / equity investments. This trend could impact freight by increased operating cost in the form of tolls; however, freight would also benefit through a greater reliability of the highway facility.

Other possible trends in the Federal public policy area which could affect transportation include:

- Federal water resource policy-making criteria can significantly impact the reliability of waterborne freight usage from year to year by reducing the navigable days during extreme conditions.
- The aging and outdated lock and dam system is in need of replacement to efficiently accommodate barges; however, there is currently no Congressional funding to accomplish this. A lock and dam failure could dramatically shift barge commodities to rail or truck.
- U.S. Department of Agriculture (USDA) and foreign government food product traceability requirements make bulk (barge, unit train) food shipping less attractive to some shippers.
- U.S. Department of Homeland Security (DHS) requirements for electronic pre-filing of export documentation for exported commodity shipments are viewed by some shippers as an impediment to export flows, as it potentially adds time. This may lead to an increase in foreign trade zones for export shipments as a way to consolidate security procedures.
- U.S. Environmental Protection Agency (EPA) additional tier emissions requirements for marine diesel barge engines and rail locomotive engines will increase costs to companies which would be required to retrofit or replace existing engines.
- Connected Vehicles is an emerging technology that allows vehicles to travel closer together, at a consistent speed through the use of technology. The use of dedicated short range communications allows vehicles to share speed and braking information, allowing surrounding vehicles to automatically adjust. It can provide a more reliable travel time on the highways by reducing crashes and travel speed variations.
- At the local and statewide level, the acceptance of "Complete Streets" is a growing trend that may impact the movement of freight, particularly in the last mile of delivery. To date 18 cities/counties and five regional planning organizations have "Complete Street" policies. The Missouri General Assembly passed a resolution in support of Complete Street policies at all levels of government in May 2011. With a growing trend of increasing home delivery of products ordered on-line and in-store, Complete Street policies need to plan for ways to accommodate home delivery vehicles.

⁴ Panama Canal Expansion Study - Phase I Report, US Department of Transportation, November 2013.

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MAP-21 Comprehensive Truck Size and Weight Study

During the last transportation reauthorization (MAP-21), Congress called on the USDOT to conduct a study on specific areas of federal truck size and weight limits, including their operation and their impacts. Congress requested an evaluation of several alternative truck configurations (Table B-8). The analysis of these configurations will address differences in safety risks, infrastructure impacts, and the effect on levels of enforcement between trucks operating at or within Federal limits and trucks legally operating in excess of Federal limits. The study will also estimate the effects of freight diversion from other modes due to these alternative configurations. The results of this study are due to Congress prior to the next transportation reauthorization. Currently the study is scheduled to be completed in the fall of 2014. These shifts could affect the volume of truck traffic that would be required to carry a given amount of freight and the weights of trucks traveling on different parts of the highway system. These changes in turn will affect safety, infrastructure preservation costs, productivity, energy consumption, environmental emissions and other factors.

Table B-8: Configurations for Analysis in the Comprehensive Truck Size and Weight Limits Study⁵

Configuration	Configuration Description	Trailers or Semi-Trailers (#)	Axles (#)	Gross Vehicle Weight (lbs.)
1.	Five-axle vehicle	1	5	80,000 [baseline]
		1	5	88,000
2.	Six-axle vehicle	1	6	91,000
		1	6	97,000
3.	Tractor plus two 28 or 28 ½ foot trailers	2	6	80,000 [baseline]
4.	Tractor plus twin 33 foot trailers	2	6	80,000
5.	Tractor plus three 28 or 28 ½ foot trailers	3	7	105,500
6.	Tractor plus three 28 or 28 ½ foot trailers	3	9 or 10	129,000

Source: FHWA Freight Management and Operations web: <http://www.ops.fhwa.dot.gov/freight/sw/map21tswstudy/index.htm>

Regulatory Impacts on Trucking Labor Productivity and Availability

The Federal Motor Carrier Safety Administration (FMCSA) regulates hours of service (HOS) for commercial truck drivers with the goal of preventing job conditions from causing excess fatigue in order to increase safety. In general, drivers of property-carrying commercial vehicles are limited to driving a maximum of 11 hours after 10 consecutive hours off duty. Drivers are also limited to 60 hours of driving in seven days or 70 hours in 8 days. FMCSA updated HOS regulations in December 2011 to limit '34-hour restarts' to once per week. This provision allows for a driver to 'reset' the amount of hours they have driven for a given week by being off-duty for 34 consecutive hours. The new rule also requires drivers to take a 30 minute rest every 8 hours.⁶ The new provisions took effect July 1, 2013, after many legal challenges that prevented the FMCSA from reducing the HOS from 11 to 10 hours per shift. If regulations limit the operating hours of drivers further, the trucking industry's delivery capacity will also be restricted. The trucking industry is already experiencing a driver shortage, creating a strain on the industry capacity to move freight. Further operating restrictions will only add to this strain.

Federal regulations also require all interstate truck drivers to be 21 years of age or older. However, states are able to set their own age requirement for drivers operating intrastate; in Texas, that age is 18. The trucking industry has raised concerns that the federal age requirement for interstate trucking restricts the labor market for drivers. Combining this restriction with the discretion insurance companies place on young potential truck drivers, carriers often prefer to hire individuals over the age of 23. This is perceived as a negative by the industry because as individuals get older, start families and have increased responsibilities, the long hours and variable locations associated with the truck driving profession may become less desirable to the drivers.

⁵ FHWA Freight Management and Operations web: <http://www.ops.fhwa.dot.gov/freight/sw/map21tswstudy/index.htm>

⁶ "Hours of Service of Drivers, Final Rule." *Federal Register* 76 (27 December 2011): 81134-81188. Web: <http://www.fmcsa.dot.gov/rules-regulations/administration/rulemakings/final/HOS-Final-Rule-12-27-11.pdf>

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Population

The economy is driven by people. It takes people to produce and manufacture the goods and products that are shipped out of Missouri and it is people that drive the demand for consumable goods within Missouri. As such, an examination of Missouri's projected population trends and growth is a key element in the future of freight.

Population Trends

As Missouri's population and employment grows, the demand for and production of finished goods that will be transported will also increase throughout the state. According to Woods and Poole Economic data, Missouri is expected to have an annual growth rate of 0.62 percent from 2012 to 2040. This results in over a million additional Missourians by 2040. **Table B-9** shows the 10 fastest growing counties by annual growth rate. These growth counties are all located near urban areas of St. Louis, Kansas City, Columbia, Springfield/Branson and Joplin.

Table B-9: Highest Projected Annual Growth Rate by County

County	2012 Population	2040 Population	Annual Growth Rate
Christian	79,824	143,530	2.12
Platte	92,054	163,260	2.07
Cass	100,376	171,910	1.97
Clay	227,577	358,420	1.64
Boone	168,535	263,150	1.60
Lincoln	53,354	79,870	1.45
Newton	59,069	86,110	1.36
Taney	52,956	76,300	1.31
Greene	280,626	397,020	1.25
St. Charles	368,666	517,450	1.22

Source: Woods and Poole Economics

Missouri follows national trends of population growth in and around urban counties with less or negative growth in rural counties. By 2040, Missouri population is estimated to be over 7 million people. **Table B-10** identifies the ten most populous counties in 2040. Similar to the projected fastest growing counties, the estimated top 2040 county populations are near St. Louis, Kansas City, Columbia and Springfield.

Table B-10: Highest Projected Population by County

County	2012 Population	2040 Population	Annual Growth Rate
St. Louis	1,000,438	1,050,850	0.18%
Jackson	677,377	682,610	0.03%
St. Charles	368,666	517,450	1.22%
Greene	280,626	397,020	1.25%
Clay	227,577	358,420	1.64%
Jefferson	220,209	295,380	1.05%
Boone	168,535	263,150	1.60%
St. Louis City	318,172	246,080	-0.91%
Cass	100,376	171,910	1.97%
Platte	92,054	163,260	2.07%

Source: Woods and Poole Economics

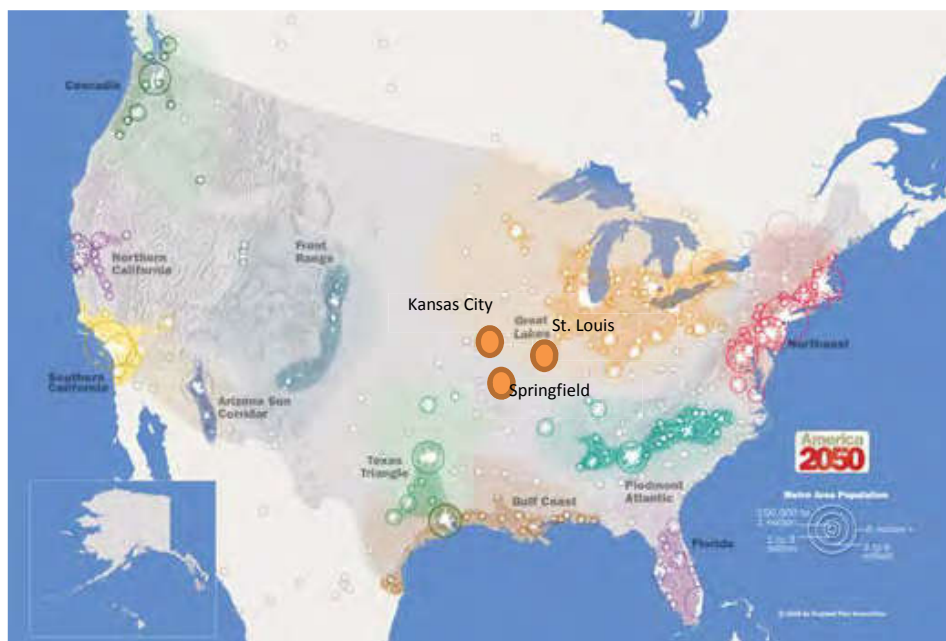
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Mega-Regions

Attention has been given to the concept of mega-regions as geographers, planners, and economists have realized that mega-regions, rather than particular cities, states, or nations, are the real driving force in the world economy.

Ten mega regions in the United States have been identified by America 2050 in their “America 2050: A Prospectus”.⁷ These mega-regions (Figure B-9) are where, by mid-century, “more than 70 percent of the nation’s population growth and economic growth is expected to take place,” with an increased movement of goods, people and capital between those regions. As these mega-regions increase their roles in the national and global economy, pressure and increased congestion for ports, highway facilities, railroads, intermodal yards, and other freight facilities will only increase. While specific area delineation differs, by one count, mega-regions in the United States account for only 30 percent of the geographical area, but 77 percent of both population and employment, 81 percent of gross regional product, and 92 percent of Fortune 500 Companies’ revenue (all 2008).⁸ Effective freight planning will take into account not only movement within each of these mega regions, but also freight movement from one mega-region to other mega-regions.

Figure B-9: Emerging Mega Regions



Source: America 2050

The northern portion of Missouri falls within the Great Lakes mega region. Kansas City, St. Louis and Springfield are the closest cities to the western and southern mega regions, providing excellent opportunities as a trade center between these other mega regions.

Infrastructure Preservation

This section highlights the infrastructure maintenance needs on the aging freight network. The maintenance of the nation’s waterway lock and dam infrastructure and highway/bridges are important factors in providing an efficient freight system.

Port and Waterway Maintenance

The lock and dam network, under the jurisdiction of the U.S. Army Corps of Engineers, was implemented to control the river levels and to maintain a minimum nine-foot-deep channel on the upper Mississippi River for more reliable navigation. With the exception of Lock and Dam 26 (Melvin Price), which was opened in the 1990s, the majority of the locks and dams were constructed in the 1930s and are showing their age. The locks and dams are in need of major rehabilitation or replacement which is an expensive undertaking. Replacement may be the most economical option as many of the locks are undersized for today’s larger barge tows.

⁷ America 2050 Prospectus, page. 4.

⁸ Ross, C., & Woo, M., “Megaregions and Mobility.” The Bridge. National Academy of Engineering. Vol 41, No 1 Spring 2011: 27-34

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The seven locks and dams in or near Missouri are part of the Upper Mississippi River starting just north of St. Louis to the Iowa Border and listed in **Table B-11**. The Lower Mississippi River (south of St. Louis) and the Missouri River contain no locks or dams.

Table B-11: Upper Mississippi Locks and Dams in or Near Missouri

Lock/Dam Number	Location
No. 20	Canton, MO
No. 21	Quincy, IL
No. 22	Saverton, MO
No. 24	Clarksville, MO
No. 25	Winfield, MO
No. 26 (Melvin Price)	East Alton, IL
No. 27 (Chain of Rocks Dam)	Glasgow Village, MO
No. 27 (Chain of Rocks Lock)	Granite City, IL

Source: U.S. Army Corps of Engineers

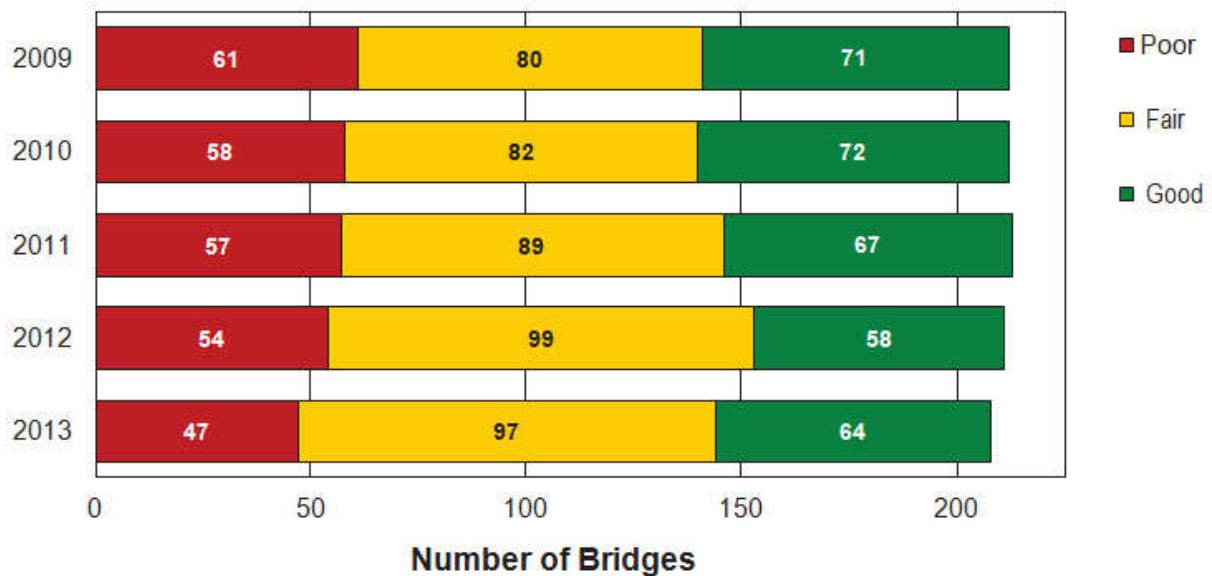
The maintenance needs of the aging infrastructure are increasing at a rate much greater than the operations and maintenance funding provided for the system which adversely affects reliability of the system. Long-established programs for preventive maintenance of major lock components have essentially given way to a fix-as-fail strategy, with repairs sometimes requiring weeks or months to complete. Depending on the malfunction, extended repairs can have major consequences for shippers, manufacturers, consumers, and commodities investors. Replacement may be the most economical and feasible option as many of the locks are undersized at 600 feet and cannot accommodate the standard 15-barge tow configuration which is 1,200 feet. This causes operators to have to run smaller configurations or break down the barges, adding time to a shipping method that is already slower than others.

Highway and Bridge Maintenance

Missouri has more than 33,000 miles of highways and 10,000 bridges to maintain. Currently more than 89 percent of Missouri's major highways are in good condition which is ahead of the 85 percent target set by Missouri. Despite significant investment in Missouri major bridges, which have resulted in decreasing number of structures in the poor category, the number of structures in the good category also decreased. Missouri has 208 major bridges. A major bridge is defined as one that crosses a river or lake and is 1,000 or more feet long. Major bridges are very expensive to rehabilitate and replace. A simple rehabilitation typically costs over \$10 million while major bridge replacements can reach into the hundreds of millions of dollars. Major bridge conditions by year are shown in **Figure B-10** below.

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Figure B-10: Statewide Condition of Major Bridges (208 Total Bridges)



Source: MoDOT Tracker, July 2014 edition

Logistical Challenges

There are a number of logistical challenges facing shippers in Missouri and throughout the Midwest. There are two key direct cost challenges facing shippers. They include the variability of rates as they relate to the variability of fuel costs and truck driver availability. Similar to truck drivers, the availability of truck and rail equipment is an issue shippers are facing. As a result of limited containers and chassis, coordinating equipment movement to assure the necessary volume of chassis and containers are at the same location when they are needed is crucial.

Recently some shippers have had to change container service providers as a result of recent mergers and consolidation alliances. This results in adjustments to processes, reporting and logistical coordination. In addition, shippers must adjust to changes related to content identity and preservation. This is especially true with bulk commodities that will lose their unique characteristics if comingled during storage, handling or shipping. For example, maintaining and preserving organic-raised commodities from traditionally raised commodities is a new challenge.

The challenges facing shippers mentioned above are all in addition to the ongoing challenges of handling growing volumes and the pressures of on-time delivery.⁹

Technology

Today technology is often associated with advanced electronics, but traditionally technology is more broadly defined as the application of *knowledge to the creation and use of technical means and their inter-relation with life, society and the environment*.¹⁰

As freight volumes have dramatically increased across the U.S. during the past several decades, concepts for dedicated freight infrastructure, such as dedicated truck lanes, have increasingly entered the transportation discussion. Dedicated truck lanes physically separate commercial vehicles from passenger vehicles or mixed traffic flows. In recent years a number of states, including California, Florida, Georgia and Texas, have examined dedicated truck lane concepts, as have a number of multistate corridor coalitions such as I-70 and I-10. Figure B-11 shows an example of a dedicated truck lane. While highway lanes dedicated

⁹ Global, National Impacts on Heartland Logistics, Paul Bingham presentation at Heartland Shippers Conference, May 13, 2014

¹⁰ Dictionary.com <http://dictionary.reference.com/browse/Technology>

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to commercial vehicles may not seem like advanced technology, separating vehicle streams introduces a new level of complexity in highway design (i.e. on/off ramps) and operations (dealing with incidents or breakdowns).

Missouri has investigated and studied dedicated truck lane opportunities on I-70 in two different efforts. The studies included the I-70 Corridor Environmental Impact Statement (EIS) across the State between the eastside of Kansas City area to the west side of the St. Louis area. Missouri also participated in the I-70 Corridors of the Future planning as one of the four states investigating truck only lanes through Ohio, Indiana, Illinois, and Missouri.

Figure B-11: Example of Dedicated Truck Lanes



To date, few examples exist of operating dedicated truck facilities, and those that do exist tend to be relatively short routes serving ports or key border crossings. The concept of long-distance truck lanes is frequently tied to tolling as the means of raising revenue to support construction. The trucking industry has expressed strong opposition to tolling truck lanes due to high administrative costs compared to traditional fuel taxes and the reluctance or refusal of shippers to reimburse carriers. Some dedicated truck lane concepts would also force trucks off infrastructure constructed in part with taxes and fees already paid by the industry. Benefits associated with dedicated truck-lanes include significant safety gains, the potential of adopting high productivity vehicle (HPV) configurations and the possibility of infusing advanced technologies that fall under the umbrella of Intelligent Vehicle Initiatives (IVI). HPV configurations such as heavier trucks with more axles or longer combination vehicles (LCVs) have been proposed as one means of offsetting the costs of tolls often associated with dedicated truck facilities.

Freight Shuttle System

The Texas A&M Transportation Institute (TTI) has been advancing the concept of an elevated structure dedicated solely to the transport of freight called the Freight Shuttle System (FSS) shown in **Figure B-12**. In this concept, autonomous transporters would carry truck trailers or containers along an elevated guideway designed to be located along the median of an existing right-of-way, usually a freeway or highway. The transporters would use electrically powered linear induction motors that are efficient and do not add emissions on site; guideway construction uses a technique requiring no road closures.¹¹

¹¹ "The Freight Shuttle System: A 21st Century Solution to Freight Transportation Challenges." Texas A&M Transportation Institute. Web. 5 Sep. 2013.
↪ <http://tti.tamu.edu/freight-shuttle/>.

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Figure 12: Freight Shuttle System Autonomous Transporter and Guideway



Source: TTI

The pilot location proposed for implementation of the FSS is Juarez, Mexico to El Paso, Texas, a distance of 11.7 miles. Freight Shuttle International (FSI) has signed a letter of intent with the City of El Paso, the City of Ciudad Juarez, and the Regional El Paso Economic Development Corporation to privately finance and build the project.¹²¹³ If and when it is completed, the FSS could change the dynamic of short- and medium-range freight shipments by reducing congestion and deterioration of roads, increasing import and export capacity, and easing the infrastructure burden on public tax dollars.

As vehicle research and technology continues to explore autonomous vehicles, driverless vehicles are still likely many years away. However, the use of vehicle-to-vehicle and vehicle-to-infrastructure communication to 'train' or platoon groups of vehicles is likely to be seen sooner. Sensor communication between vehicles will adjust the vehicle speed to prevent collisions. Freight and passenger vehicles will benefit from a reduction in congestion related to crashes, reduced operating costs, and more reliable travel times.

Likewise, the Rail Safety Improvement Act of 2008 mandates that Positive Train Control (PTC) be implemented across a significant portion of the nation's rail industry by December 31, 2015. PTC is advanced technology designed to automatically stop or slow a train before accidents occur.

¹² The El Paso Regional Economic Development Corporation (REDCO) merged with the Paso del Norte Group to form the Borderplex Alliance in early 2013.

¹³ Crowder, David. "Freight shuttle for border bridges." El Paso Inc. 23 12 2012. Web. 5 Sep. 2013.
◀http://www.elpasoinc.com/news/top_story/article_9f741ea4-4d1b-11e2-bd13-0019bb30f31a.html?mode=story▶.

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E-Commerce Delivery

E-Commerce in the U.S. increased from 0.6 percent of total retail activity in 1999, to 5.5 percent in the first quarter of 2013. The rapid increase of E-Commerce and related increase to direct home delivery has impacted the freight network. Similar to traditional retailers such as Wal-Mart and Target that have implemented a series of distribution warehouses as part of their supply chain management and to facilitate just-in-time delivery, e-retailers such as Amazon and eBay have constructed a series of centralized distribution centers. E-commerce requires fast, on-time delivery, which is sensitive to both distance and congestion. These distribution centers help the e-commerce retailers achieve next-day or even same day delivery for their products.

Common to this trend is the higher penetration of parcel delivery vehicles into residential neighborhoods delivering products ordered online. According to the 2007 Commodity Flow Survey, the value of freight shipped by parcel, U.S. Postal Service, or courier, increased from 11.8 percent of total freight by value in 2002 to 13.4 percent in 2007. As residential deliveries increase, planners fear an increase in related congestion and wear and tear to the local road network as this form of freight traffic disperses from major arterial networks into local neighborhoods. The short temporary parking requirements of delivery vehicles will need to be considered as state and local governments implement "Complete Streets".

Energy

Natural gas, as compressed natural gas (CNG) and liquefied natural gas (LNG), is the fastest-growing fuel in the transportation sector, with an average annual growth rate of 11.9 percent from 2011 to 2040.¹⁴ Heavy duty vehicles (HDVs)—which include tractor trailers, vocational vehicles, buses, and heavy-duty pickups and vans with a gross vehicle weight rating (GVWR) of 10,001 pounds or more—lead the growth in natural gas demand throughout the projection period.¹⁵ However there is an initial high total cost to retrofit or replace existing equipment. If trucking companies elect to make the switch, they will first need public LNG fuel stations every 400 miles on major truck corridors before adopting alternative fuels for their fleets.

Natural gas prices remain comparatively lower than other countries in 2014, which provides enormous competitive advantage to the nation's energy-intensive industries. As companies invest to capitalize on lower energy costs, heavy manufacturing is likely to grow and outbound rail and waterway freight transportation is a key to siting plants.

If global conditions do not change, the price of diesel fuel is likely to remain stable or increase. The diesel fuel used in extracting oil and natural gas from shale rock formations sets a price floor for diesel. The outlook for natural gas is similar, as low natural gas prices lead to a corresponding drop in shale gas drilling due to less profitability, which in turn reduces supply, and less supply tends to raise prices.

Container-on-Vessel

Port authorities, government agencies and shippers look to the feasibility of container-on-vessel (COV) service to enhance existing truck and rail transport. COV is cost-effective for shippers in unit, operation and labor costs when compared to rail and truck. Potential obstacles to greater use of COV in Missouri include: readiness of ports, delivery requirements for ports to sustain service, and inefficiencies in backhauling empty containers. Most port authorities don't currently provide containerized cargo.

Initiation of COV service depends on the development of partnerships between key port operators and shipping stakeholders. According to "Missouri Public Port Authorities: assessment of importance and needs," all current port facilities, with limited capital investments, could operate as a COV facility.

¹⁴ U.S. Energy Information Administration. Web June 20, 2014. <http://www.eia.gov/forecasts>

¹⁵ U.S. Energy Information Administration. Web June 20, 2014. <http://www.eia.gov/forecasts>

Needs Input

In an effort to identify needs and issues affecting the efficient movement of freight in Missouri, information from a variety of sources was gathered and analysis was performed. In order to identify needs it is important to understand the current conditions of the freight system, which provides us with a snapshot of how freight moves today. The key inputs into identifying needs include: regional freight plans, stakeholder input, freight transportation system assets inventory and assessment, and analysis of the conditions and performance of the State's freight system.

Regional Freight Plans

Both the Kansas City and St. Louis metropolitan areas have regional freight plans in place. The Kansas City Regional Freight Outlook and the St. Louis Regional Freight Study both provide a forecast of growth in freight movements in Missouri on regionally defined freight networks. Each plan highlights improvement recommendations and needs in each region.

Kansas City Regional Freight Outlook

The Kansas City Regional Freight Outlook was produced in 2009 with the following regional objectives.

- Improve goods movement system performance
- Support transportation and logistics business attraction and retention
- Contribute to ensuring the region's quality environment

The plan focused on a number of critical actions to complete over a three- to five-year period, which covered through 2014. As a result, many of the recommendations have already been completed.

St. Louis Regional Freight Study

The St. Louis Regional Freight Study was completed in 2013 and identified strategic links to address connections between freight modes. These strategic links are:

- Water to Rail
- Truck to Water to Rail
- Rail to Rail (Intermodal)
- Repurpose Old Industrial Sites

The study noted some specific modal project recommendations and needs in the region. Rail improvement needs include rebuilding the western approach to the Merchants Bridge, adding a third mainline track from Grand Avenue to the MacArthur Bridge, and double-tracking the BNSF rail line under I-44. Trucking needs include additional capacity on the I-270 New Chain of Rocks Bridge, improved route signing for through trucks, ITS improvements to relay real time bridge congestion, and monitoring of truck heavy intersections and arterials near intermodal yards. Waterway modal recommendations include exploring container-on-vessel opportunities, reusing old riverfront sites for higher value manufacturing activities, and working with the private sector to move from high volume transload terminals toward more unit train capacity terminals. The study did not mention any project needs related to the air cargo services at Lambert-St. Louis International Airport.

Stakeholder Input

Due to the unique character and diversity of the freight industry, representation from the providers and users in all modes of the freight transportation system were necessary. This diverse group provided an opportunity to help identify key issues and opportunities in the freight system. To ensure adequate and appropriate engagement with the freight community, a variety of tools were utilized, including freight stakeholder interviews; motor carriers, shippers, and receivers surveys; and district freight forums and webinars. The following sections discuss the information gathered from the stakeholder involvement process to date, with continuing outreach efforts to follow.

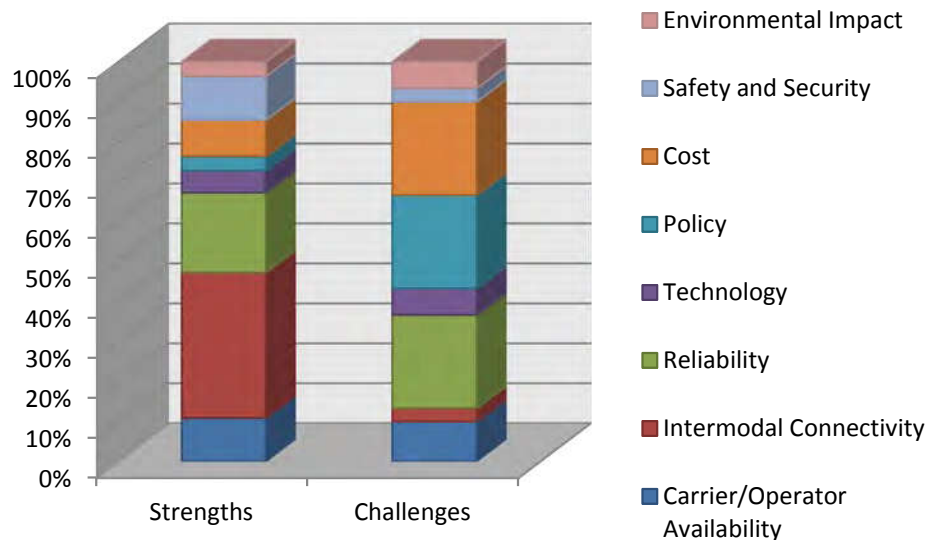
Appendix B: Trends, Needs, and Issues

Freight Stakeholder Surveys

The purpose was to solicit input, ideas, perceptions, concerns, and attitudes; and to identify key issues related to freight movement throughout the state.

A wide range of freight stakeholders, including trucking companies, railroads, and port authorities completed the survey. In total 31 surveys were completed, 21 (68 percent) of which were completed by representatives of the transportation and warehousing industry. Respondents of the survey indicated that the availability of several modal choices is the greatest strength of Missouri's freight system and reliability, policy, and cost are the greatest challenges. **Figure 13** shows strengths and challenges that were identified.

Figure 13: Strengths and Challenges Identified by Freight Stakeholders



In addition, respondents to the survey were asked where they would spend money to improve the freight transportation system. Respondents provided a variety of answers to this question, the most frequent being:

- Improve the locks and dams
- Improve and expand port facilities
- Increase dredging
- Increase highway and railroad capacity
- Improve intermodal connectivity

Motor Carriers, Shippers, and Receivers Surveys

The Missouri Department of Transportation (MoDOT) began engagement efforts for the State Freight Plan in December 2013, targeting key business and community stakeholders. MoDOT identified 96 contacts in freight-related services including manufacturing, economic development, logistics, and carriers. An email invitation announcing the project was distributed with the Plan fact sheet to familiarize stakeholders with the launch of the Plan and the consultant team followed up with phone interviews. In total, 53 interviews were conducted. The statewide themes heard by the stakeholders include:

- Missouri is a "crossroads for the continent". Missouri's central location in the United States was consistently identified as a top strength of the state's freight system and an asset for attracting new business. The state utilizes all of the different freight modes, and many stakeholders considered freight diversity to be another strength of the network, as long as all of the options are working together. Cooperation between modes is reported to be "relevant nationally".
- Interviewees' freight needs focused on Interstates and railroads. Across all freight services, discussion centered on trucks and rail. Although I-70 does not pass through every district, the majority of stakeholders indicated capacity upgrades from Kansas City to St. Louis are needed to maintain network reliability. Several other Interstate routes, including I-44, were also mentioned as key corridors for continued investment. Manufacturers also heavily utilize rail

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and want to see this mode continue to operate efficiently, but understand the challenge of planning for an asset that is owned and operated by private entities.

- An opportunity exists for ports to provide increased capacity and alleviate congestion in other modes, but ports require additional investment. Several stakeholders see potential for growth on the Missouri and Mississippi Rivers, but consistently brought up concerns including infrequent dredging and lack of improvements to the lock and dam system. The Panama Canal expansion was also mentioned by some stakeholders who want to make sure the state is positioned to take advantage of increased freight flow
- Stakeholders were interested in public-private partnerships to fund freight infrastructure improvements and incentives to attract new business. Business and community leaders were also asked what strategies Missouri could utilize to promote freight transportation. "Competing states are bringing resources to the table" was mentioned several times, and interviewees want Missouri to be in a position to remain competitive. Many stakeholders indicated cost-sharing initiatives with private freight networks and providers (rail, waterways, pipelines) would enhance economic development and that public freight networks (roads) should pay for roadway maintenance and capacity upgrades. Stakeholders across all freight services were concerned about the availability of funds for future investment.

District Freight Forums and Webinars

Seven district freight forums were held throughout the state. The purpose of the forums was to ensure that the perception of the freight trends, needs, and issues are understood and to expand the dialogue that was started as part of MoDOT's long range transportation plan. **Table 12** lists the date and location of each forum that was held. Around 150 stakeholders participated in the District Freight Forums. Due to weather, the Hannibal in-person forum was cancelled and a webinar was held to present the information and receive input.

Table 12: District Freight Forums

District	Date	Location
Central	January 29, 2014	Jefferson City
Northwest	January 30, 2014	St. Joseph
Kansas City	January 31, 2014	Kansas City
Northeast	February 4, 2014	Hannibal
St. Louis	February 6, 2014	Chesterfield
Southwest	February 7, 2014	Springfield
Southeast	February 25, 2014	Sikeston

Recurring themes heard during the forums from across the state include:

- Missouri generally has a well-connected and functioning road network until there is a hiccup, such as congestion, weather, or construction. Stakeholders also identified a need for capacity and maintenance improvements to maintain reliability of Interstates and minor routes.
- I-70 is a vital transportation link for the State and needs to be improved across the State.
- Missouri is a "crossroads for the continent" and has a vast freight network that is an asset for retaining existing businesses and attracting new business. Stakeholders voiced concern that not all modes are readily accessible and well connected with other modes (e.g. rail to water ports) and that work needs to be done to integrate the freight modal networks.
- There is a need to engage additional stakeholders to help guide the freight plan. Previous efforts have lacked private sector engagement. Over the last several years MoDOT has collaborated with several private sectors groups on successful projects. This is an opportunity to build on those relationships, share information, and continue to collaborate.
- Investigate possibilities for utilizing waterways. Stakeholders see potential for growth on the Missouri and Mississippi Rivers but consistently brought up concerns including frequency of dredging, lack of improvements to the lock and dam system and inconsistent water levels. The expansion of the Panama Canal was also mentioned by stakeholders

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who want to make sure the state is positioned to take advantage of potentially increased freight flow and remain competitive. Stakeholders are concerned about low water levels and the impacts to operations if dredging frequency decreases.

- Appropriately funding freight transportation projects is a key stakeholder concern. Stakeholders voiced a need to preserve the existing freight network and systems, but also said that improvements and enhancements are key to growing the state's economy.

The following sections provide a summary of the three to six key issues heard during each of the district forums.

Central

The following are the key items that were discussed during the Central District forum.

- Innovative funding options should continue to be explored. Stakeholders in this district are concerned that funding gaps are threatening programs that are working well, such as MoDOT's cost share program.
- Efforts should be made to improve connectivity throughout the district. Stakeholders identified a need for improving north-south connections and specifically noted concerns with US-63 between Jefferson City and Rolla. The district could also benefit from improvements to I-70, such as increased lanes, as the Interstate is critical to moving freight and supporting the agriculture industry. Several stakeholders suggested that a multi-modal hub between Columbia and Jefferson City would support economic development in the district.
- The Missouri River is underutilized and under-marketed. Stakeholders recognize that the district should expect increased demand over the next five years and beyond. Utilizing waterways will be critical in effectively moving additional freight and taking strain off of highways and rail lines.
- The freight system needs to support the agriculture industry, which is key to the economic success of the district and the State. As one stakeholder noted, "2014 ag industry technology is being moved on a 1940's (freight) network."

Northwest

The following are the key items that were discussed during the Northwest District forum.

- Farm-to-market routes are essential to the region's economy. Rail access in this region is decreasing, so lettered routes are very important, not only for moving agriculture goods, but also as connections for manufacturers to highways and Interstates.
- Road capacity upgrades are important in the region. Despite I-70 passing outside of the district to the south, stakeholders indicated that it should be improved to a six-lane facility. Stakeholders also suggested increasing capacity to four lanes between I-29 and I-35 through Maryville.
- US-36 is an important corridor for business owners and should be considered for Interstate designation. One private truck freight fleet operator called US-36 a "national best-kept secret." He explained that it is a safer route and that it saves his drivers an hour in drive time to Indianapolis.
- There is a dwindling rail presence in the district. Stakeholders pointed out that there were more freight rail options in the past and many of those options no longer exist in the district.
- Economic development efforts, such as the Eastowne Business Park in St. Joseph, need adequate roadway access. In addition, food industry businesses, such as Farmland Foods, could benefit from investment in intermodal access.
- Low water levels and water quality in the district and throughout the State concern stakeholders, as does local port funding.

Kansas City

The following are the key items that were discussed during the Kansas City District forum.

- The Kansas City community is proud of its status as one of the largest rail freight and trucking hubs in the country. Stakeholders commented that integrating different freight modes is important regionally and nationally. Assets in this district include a rapidly growing Foreign Trade Zone and the BNSF multi-modal facility located across the state line in Kansas, which will have the largest speculative space in the country.
- Capacity upgrades to I-70 are a top priority in the Kansas City District as well as across the State. The importance of the I-70 corridor to freight movement is echoed throughout all of the districts. Additional lanes were suggested to

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provide better reliability along the corridor. Other top priority corridors identified included I-44 and the south leg of I-435.

- Private sector engagement is a crucial part of crafting a meaningful freight plan. Stakeholders suggest that key businesses, including railroads, should be brought into crafting the plan and that the best way to do that is through cultivating relationships and building trust. In addition, information on private sector freight movements that has not been available in the past is needed for a complete freight picture and a plan that enhances economic development in the State.
- The increase in the use of e-commerce is changing the way that freight stakeholders conduct business and will require a freight system that accommodates that shift. Stakeholders pointed out that more distribution centers will lead to greater pressure on roadways.

Northeast

The following are the key items that were discussed during the Northeast District forum.

- Capacity expansion and maintenance of highway networks are essential to ensuring network reliability. Specific examples of maintenance issues provided by stakeholders included US-36 from Shelbina to Hunnewell and Monroe City and along US-61 between Palmyra and Hannibal. Road surfaces in many sections are “rougher than a cob.” Capacity issues include too much truck traffic on I-70, and bottlenecks on US-61 in Hannibal and on the I-70 interchange in Warrenton.
- Future growth is threatened by railroads closing local crossings and spurs and removing scales in this district.
- Locks and dams along the Mississippi River need improvement. Port stakeholders in this region mentioned the deteriorating condition of the lock and dam system as a challenge for Missouri freight in the future.

St. Louis

The following are the key items that were discussed during the St. Louis District forum.

- St. Louis is challenged to compete as a freight hub, and focus should be placed on developing opportunities for intermodal activities and international export. Stakeholders said transforming St. Louis to a major freight hub status is needed to grow the regional economy. While “St. Louis tends to be a pass-through,” there are opportunities to develop additional facilities, particularly as an alternate freight hub to Chicago, which is highly congested. Stakeholders would like the public to be better informed on how freight transportation infrastructure supports the economy and jobs.
- Congestion on I-70 and I-44 causes costly delays and some safety concerns.
- It is difficult to move freight from ports and airports directly to destinations. Better connectivity is needed between the freight modes. Stakeholders are concerned about the difficulty businesses have in making the “last-mile connections.” This issue was recently raised when trying to attract large economic development deals to the region.
- Air cargo facilities are available at Lambert Airport, but they are dated and small.
- Deficient bridges in the district could cause costly delays and pose safety concerns for carriers.
- There is a shortage of available motor carriers and truck fleets as it is becoming increasingly difficult to recruit and insure drivers, and many fleets have left St. Louis. These shortages are driving up costs to move freight on roadways.

Southwest

The following are the key items that were discussed during the Southwest District forum.

- Interstate capacity upgrades are needed. Many stakeholders suggested adding lanes to I-70 and I-44. “I-44 is aging out and will need additional capacity as the population increases in the region.” Congestion on these Interstate corridors is a top concern for many, especially in urban areas. One stakeholder recommended completing I-49 to the Arkansas state line.
- Motor carrier accommodation and recruitment is a high priority in this district. A recurring theme from stakeholders is the need for better accommodations for motor carriers, such as improved and larger rest areas. In addition, stakeholders are interested in motor carrier recruitment, driver training programs for the general public to increase safety on roadways, and less regulation on drivers.
- Funding programs for freight should be flexible so each district can target their specific needs, regardless of mode.

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Southeast

The following are the key items that were discussed during the Southeast District forum.

- East-west connectivity is limited regionally and a St. Louis bypass could help congestion. Capacity concerns in the St. Louis area led many stakeholders to suggest an east-west or diagonal corridor to provide “this area a direct route through central Missouri” as an alternative to the longer I-55/I-70 route. Another interviewee said Missouri “needs an ‘X’ through the middle of the state to connect southeast Missouri with Kansas City and Kirksville to Joplin and Springfield.” Stakeholders also suggested a freeway-type roadway (i.e. four-laning US-60 across the state).
- US-67 is a key north-south connection, and completing the route through Arkansas would increase economic opportunities.
- Industry relies on secondary highways for time-sensitive delivery and connections to Interstates, and the condition of these roadways could be improved. Several stakeholders suggested resurfacing and capacity upgrades.
- Stakeholders are concerned about funding for ports and waters for small-level capital projects. Additionally, several stakeholders commented about the need for consistent support of dredging.

Needs Identified

Based on the results of the tasks discussed in the previous sections, this section identifies the key freight system needs. Through the analysis of these tasks, 28 general freight network needs were identified. The needs identified are discussed below by mode of freight transportation and fall into one of six categories: system capacity, system operations, freight network, safety, connectivity, and policy regulations.

Highway

The freight system needs identified for the highway mode of transportation include needs falling under five of the six categories listed above. The identified freight system highway needs are:

- Improved potential corridor capacity.
- There are bottlenecks throughout the State at a number of locations on the highway network. These bottlenecks can be caused by capacity issues, as well as geometric issues. Improvements are needed to eliminate these bottlenecks. The improvements will be dependent on the cause of the bottleneck. Bottlenecks could be both a capacity and operations issue. **Figure 2** in Section 2 Trends and Issues of this report shows the Top 100 bottlenecks in Missouri.
- Safety is a major focus of both public and private sector freight stakeholders. Key safety needs include: the lack of safe truck parking, numerous at-grade rail crossings, and roadway design and geometrics improvements to facilitate safety.
- Major freight generator sites have been identified throughout the State. Connectivity to these sites is a key need, including the last mile connections.
- Missouri does not currently have a designated freight network. A designated freight network is needed for all modes of freight transportation, including highways, and will be produced as part of the State Freight Plan.

Rail

The freight system needs identified for the rail mode of transportation include needs under each of the six categories listed above. The identified freight system rail needs are:

- There are congestion and capacity issues on numerous rail lines throughout the State. Improvements to the rail lines with congestion and capacity issues are needed.
- A bottleneck at the intersection of rail lines in the Kansas City area currently exists. Coordination with the rail companies that own these rail lines and a solution to eliminate this bottleneck is needed.
- At-grade rail crossings throughout the State present a safety issue. Improvements at all at-grade rail crossings with safety issues are needed.
- In the Northwest and Northeast Districts, short line rail lines are being removed and hindering economic development in these areas. Coordination with the short line rail companies is needed and a different solution than removal of rail lines is needed.
- At the Howard/Cooper Regional Port and Mississippi County Port, rail access to and from these ports is needed.
- There are two bridges across the Mississippi River in St. Louis and both are in poor condition. So while there is redundancy in the system the condition of the bridges presents a problem. The condition of both of these bridges needs to be improved.
- Currently because of a regulatory and inspection issue all refrigerated goods must be shipped through Kansas City, no matter the goods final destination. A proper inspection facility to meet the regulations is needed in St. Louis to eliminate the need to ship all goods through Kansas City.
- Missouri does not currently have a designated freight network. A designated freight network is needed for all modes of freight transportation, including rail.

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Air

The freight system needs identified for the air mode of transportation include needs under three of the six categories listed above. Needs related to system operations, freight network, and policy regulations were identified for the air mode. The identified freight system air needs are:

- The cargo facilities at the St. Louis Airport (STL) are limited and outdated. These facilities need updated and expanded.
- The safety and perimeter security at the Kansas City International Airport (MCI) is in need of additional and improved fencing and gates. These security measures need to be updated and expanded. The Springfield Airport (SGF) has been identified has an airport that may have its tower hours reduced. The tower hours at SGF should not be reduced.
- Missouri does not currently have a designated freight network. A designated freight network is needed for all modes of freight transportation, including air.

Water

The freight system needs identified for the water mode of transportation include needs falling under four of the six categories listed above. No needs related to safety or connectivity was identified for the water mode. The identified freight system water needs are:

- At ports throughout the State increased maintenance activity is needed on both the land and water sides of the operations.
- Upgrades and rehabilitation are needed on many of the locks and dams in the State. Coordination with the US Army Corps of Engineers will be needed in order to do so.
- Missouri's position is the Missouri River water flow needs to maintain navigation depth for the entire shipping season along the entire river. This plan and its elements should support the State's position.
- Numerous emerging ports have been identified throughout the State. Support for their development is needed.
- Missouri does not currently have a designated freight network. A designated freight network is needed for all modes of freight transportation, including water.

Pipeline

The freight system needs identified for the pipeline mode of transportation include needs under three of the six categories listed above. Needs related to system capacity, freight network, and policy regulations were identified for the pipeline mode. The identified freight system pipeline needs are:

- More pipelines across the State are needed to meet the demands of the energy sector activities.
- Missouri does not currently have a designated freight network. A designated freight network is needed for all modes of freight transportation, including pipeline.

Intermodal

The freight system needs identified for intermodal facilities include needs falling under four of the six categories listed above. No needs related to system operations or safety was identified for intermodal facilities. The identified freight system intermodal needs are:

- New intermodal connection points are needed.
- Improved intermodal connection ports are needed to ports across the State.
- Last mile intermodal connections are needed.
- Missouri does not currently have a designated freight network. A designated freight network is needed for all modes of freight transportation, including intermodal facilities.

Financing

The majority of Missouri transportation funds come from the gas taxes which have not been raised since 1992 and are constitutionally limited to State roads and bridges. This has put a severe strain on the transportation sector to find alternative

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funding sources. There is need to identify innovative and alternative funding sources. Missouri has one of the lowest state fuel taxes in the nation. This, coupled with Missouri having the seventh largest state highway system in the United States, which is made up of approximately 33,700 miles of roadway, has created project funding challenges for the leaders of Missouri. Missouri port authorities have no sustained, dedicated, reliable funding sources.

Conclusions

The purpose of identifying major trends and issues likely to impact freight transportation in Missouri in the foreseeable future is to provide additional information about the future that traditional forecasting techniques would likely overlook. Looking at several trends to track and monitor issues with the potential to have the greatest impact on freight in Missouri, such as infrastructure preservation and logistics, will enable MoDOT to plan and respond more effectively and create a transportation system prepared for the future.

Appendix C-

STRENGTHS AND

CHALLENGES TECHNICAL

MEMO

Strengths and Challenges

This Strengths and Challenges of the State's Freight System Technical Memorandum discusses the strengths of Missouri's freight system and its most important challenges to solve. In addition, it discusses the Missouri State Freight Plan goals and objectives and how they are or are not currently being met.

The Strengths and Challenges for Missouri's freight system are discussed by the same four categories that the key freight needs were categorized by in **Appendix B**.

Introduction

This technical memorandum was prepared for the Missouri State Freight Plan to identify the State's competitive advantages and the most important challenges to solve. In addition, it discusses components of the freight system that do not meet State goals and objectives as defined in Appendix E.

The Moving Ahead for Progress in the 21st Century Act (MAP-21) requires that a state freight plan include an analysis of the strengths of the State's freight system that should be maintained and the challenges to be solved. This analysis shows the strengths of the State's freight system that Missouri wishes to build upon; it also shows the State's freight system components that do not meet the State's goals, and identifies which challenges are most important for the State to address. Some of these might include challenges that the State expects to face in the future as a result of increasing demand for freight transportation, lack of funding, or other trends that the State is anticipating.

The strengths and challenges of the State's freight system are discussed within four categories: System Capacity, System Operations, Safety, and Connectivity.

It should be noted that the Missouri Department of Transportation's (MoDOT's) freight system strengths cannot be maintained without adequate funding. In addition, those items identified as challenges will likely worsen as funding decreases.

Strengths and Significant Challenges of the Freight System

System Capacity

This section discusses the strengths and challenges to the State's freight system. These strengths and challenges are addressed in the context of congestion, bottlenecks, and other capacity-related issues on the system.

Strengths

- Missouri has the seventh largest State highway system in the country, but is only the 21st largest state by size and the 18th largest by population, with 33,700 centerline miles of roadway, 5,500 of which are classified as heavily traveled "major highways" and 28,200 miles of which are defined as lesser traveled "minor highways". Missouri's major highways or principal arterials encompass just 20 percent of the State highway miles but carry 80 percent of the system's traffic. There are 18 Interstate Highways within Missouri, including nine main routes and nine auxiliary routes. Freight stakeholders believe Missouri generally has a well-connected and functioning road network, which is a strength for the State that needs to be maintained and built upon.
- Since 2009, the U.S. Department of Transportation has designated several marine highways for transporting cargo on water, reducing pollution, and limiting congestion on roads. Maritime highways serving Missouri include M-29 covering the Upper Missouri River from Kansas City to Sioux City, Iowa; M-70 covering the Missouri River from Kansas City to St. Louis; M-55 covering the Mississippi River from St. Louis to the Gulf of Mexico; and M-35 covering the Mississippi River from St. Louis to the Twin Cities. This is important to Missouri because designated marine highways receive preferential treatment for federal assistance from the U.S. Maritime Administration, which Missouri can take advantage of.
- Missouri is home to three of the top 106 cargo airports in North America in terms of 2013 total tonnage: Kansas City International (MCI), Lambert-St. Louis International (STL), and Springfield-Branson National (SGF). This indicates that Missouri's airports are an important asset in the U.S. airport system, and they have the ability to handle large amounts of freight tonnage. Missouri should continue to build upon its air freight potential.

Appendix C: Strengths and Challenges

- The National Transportation Atlas Data through the Bureau of Transportation Statistics identified 114 intermodal facilities in Missouri that provide a variety of intermodal interactions. The majority of the intermodal facilities (71 percent) accommodate the rail – truck commodity transfers, followed by modal transfers at ports (16 percent) and airports (8 percent), indicating well connected truck and rail modes, which Missouri should build upon and extend connections for other modes.
- Missouri has significant freight rail infrastructure with six Class I freight railroads operating 4,218 miles of main track rail lines within the State. There are also five short line railroads that serve Missouri. These railroads provide important connections to businesses, water ports, and intermodal terminals. This is a competitive advantage in terms of rail service for Missouri to build upon.

Challenges

- Missouri has more State highway miles than Kansas and Illinois combined, but with only one-third of Illinois' revenue. This lack of funding creates a challenge for maintaining or upgrading the highway system.
- Annual hours of truck delay for CY2014 and the annual cost of delay for the trucking industry on interstate highways in Missouri is shown in **Table C-1**. Annual hours of truck delay quantifies the extra time spent by commercial motor vehicles on an interstate corridor based upon a state-determined threshold. Missouri's threshold is set at five mph below the speed limit. Speeds below that rate indicate congestion and/or other delay factors for trucks.² Time delays and additional costs affect trucking companies and can cause them to make changes to avoid these areas. This can also have an ill effect on Missouri businesses in terms of increased costs and being able to deliver in a timely manner.

Table C-1: Annual Hours and Cost of Delay on Missouri Interstates

Interstate Highway	Annual Hours Delay	Annual Cost of Delay (Millions)
I-70	399,986	34.7
I-44	421,739	38.6
I-55	221,325	19.2
I-35	125,608	10.9

Source: Missouri Department of Transportation, Tracker Report, April, 2014

- Truck freight density growth projections for the Missouri road network indicate the greatest future volume increases will occur on I-44 and I-55. Capacity upgrades on I-70 from Kansas City to St. Louis are needed to maintain network reliability. The ability to maintain or upgrade to meet these needs is limited as transportation revenues decrease. Several other interstate routes, including I-44, were also identified as key corridors for continued investment, which is a challenge as funding is limited.
- There are bottlenecks throughout the State at a number of locations on the highway network. These bottlenecks can be caused by capacity issues, as well as geometric issues. Improvements are needed to eliminate these bottlenecks. These bottlenecks cause congestion and hinder freight. Mobility in these areas may be difficult.
- The St. Louis and Kansas City metro areas account for more than 80 percent of the State's 100 worst truck bottlenecks. The St. Louis region contained 59 out of the worst 100 bottlenecks. The most severe bottlenecks appear to be concentrated near the confluence of Interstates 70, 64, 55, and 44 near downtown St. Louis (evaluation completed prior to the completion of the new I-70 bridge). In Kansas City, 22 of the worst 100 bottlenecks were identified. The complex intersection with I-70, I-670, I-35, and State Route 9 generated a truck bottleneck along all of those routes near downtown Kansas City. Springfield contained seven of the worst 100 bottlenecks. The most severe

Appendix C: Strengths and Challenges

bottleneck was in the area was located on State Route 744 (E. Kearney Street) between U.S. 65 and N. Glenstone Avenue.

- Missouri has a significant freight rail infrastructure and is uniquely positioned to the Mississippi and Missouri Rivers for providing rail access to ship and barge traffic. However, Missouri's rail lines are at or near capacity in many locations. Capacity and operational improvements to the Class 1 rail lines are needed. Freight density growth projections across the Missouri rail network indicate the greatest future volume increases will occur on the BNSF line connecting Kansas City and Chicago. This line is currently approaching its capacity and will require improvements to accommodate increasing future volumes.
- A bottleneck at the intersection of rail lines in the West Bottoms area of Kansas City currently exists. This bottleneck creates significant delays in freight rail movements. Coordination with the rail companies that own these rail lines and a solution to eliminate this bottleneck is needed.
- There are two rail bridges across the Mississippi River in St. Louis, owned by Terminal Railroad Association (TRRA), which serve all Class 1 railroads. The Merchants Bridge and the McArthur Bridge were built in 1890 and 1912, respectively. While there is redundancy in the rail system, the condition of these bridges is a concern. In addition, these are both National Freight Corridors, so their impact on the transportation system stretches beyond Missouri.
- Missouri contains 1,050 miles of navigable rivers, including 500 miles of the Mississippi River and 550 miles of the Missouri River. Three public port authorities and over 50 private ports operate along the Missouri River, while 14 public and more than 200 private ports operate on the Mississippi River.
- There is capacity to expand waterborne traffic on the Missouri and Mississippi Rivers. However, the frequency of dredging, lack of improvements to the locks and dams, and inconsistent water levels hinder an increase in traffic.
- There is an opportunity for transloading containers onto barges. However, potential obstacles to greater use of Container on Vessel (COV) in Missouri include readiness of ports, delivery requirements for ports to sustain service, and inefficiencies in backhauling empty containers.
- Initiation of COV service depends on the development of partnerships between key port operators and shipping stakeholders. According to "Missouri Public Port Authorities: Assessment of Importance and Needs" – all current port facilities, with limited capital investments, could operate as a COV facility.
- The cargo facilities at the St. Louis Airport (STL) need to be updated and expanded in order to allow for changes in technology and efficiency and also need to include aircraft capable of handling larger cargo.
- A wide range of freight stakeholders, including trucking companies, railroads, and port authorities surveyed indicate that reliability and funding are the greatest challenges facing Missouri's freight system. Concerns about reliability stem from congestion and capacity issues for these modes which slow down freight movements. The inability to move forward in these areas can often be linked back to a lack of funding to make improvements.

System Operations

This section discusses the Strengths and Challenges that were identified in the operations of Missouri's freight system. These Strengths and Challenges are associated to road and bridge conditions, freight reliability issues, and other system operations issues.

Strengths

- MoDOT started a major road improvement program in 2004 called the Smooth Road Initiative. Over the next two years, the program improved 2,200 miles of Missouri's major routes, bringing them from 47 percent in good condition up to 74 percent. The Better Roads, Brighter Future program in 2007 further improved the system, increasing Missouri's major routes in good condition to 85 percent. Currently more than 89 percent of major highways are rated in good condition.² Consequently, a majority of Missouri's major routes are currently in good condition, and freight traffic will not be slowed down for this reason. MoDOT needs to maintain this strength, although long-term funding is a challenge.
- Statewide, the number of bridge structures in poor condition dramatically decreased over the last five years and the number of structures in good condition moderately improved up until 2011. These improvements were heavily impacted by the Safe & Sound Bridge Improvement Program that was completed in 2012, and by the increased construction program that resulted from the passage of Amendment 3 in 2004. While the number of poor condition bridges dropped by 713 over this five year period, the number in good condition only increased by 276. The number in fair condition increased by 473 over this period, which is reflective of MoDOT's aging bridge population with many structures at the point where they need minor maintenance or rehabilitation.² Bridges in poor condition can slow

Appendix C: Strengths and Challenges

down traffic including freight traffic in two ways. First, the condition itself makes it so vehicles cannot travel at the most efficient speeds. Second, construction on bridges in poor condition slows down traffic or forces closures, which cause congestion. The fact that the number of bridges in poor condition is decreasing is a strength because freight traffic will not be slowed down for these reasons. For the 208 major bridges (i.e., 1,000 feet or longer) in Missouri, the number of structures in the poor category has dropped over the last five years because of an aggressive focus on these structures.²

- There is only a total of 73 low vertical clearance bridges in Missouri, which represents less than one percent of all bridges in the State. In addition, only 135 (three percent) of the 4,849 weight restricted bridges in Missouri cross interstates and 81 (two percent) cross U.S. highways. This is a strength for freight truck traffic because their travel routes are not limited by a high number of low clearance bridges that have to be avoided. This is especially true for oversized loads. MoDOT should build upon this strength by continuing to address low clearance and load restricted bridges over time.
- MAP-21 set a national performance goal to have the Structurally Deficient (SD) deck area of National Highway System (NHS) bridges at less than 10 percent. Missouri's local system has 144 NHS structures (five SD) and MoDOT's system has 3,591 NHS structures (153 SD). MoDOT currently meets the national performance goal with the total at 6.7 percent, which is attributable to aggressive efforts undertaken with rehabilitation and reconstruction on major bridges over the last 10 years as well as other accelerated construction from MoDOT's bonding program.² Roadways in poor condition can slow down traffic including freight traffic in two ways. First, the condition itself makes it where vehicles cannot travel at the most efficient speeds. Second, construction on bridge in poor condition slows down traffic and causes congestion. The fact that Missouri is meeting the national performance goal and its roadways are in good condition is a strength because freight traffic will not be slowed down for these reasons. MoDOT needs to maintain this strength, although long-term funding is a challenge.
- Transportation infrastructure leads to the attraction of new businesses and of employers looking to expand. These actions lead to new jobs, new opportunities and new revenue for states. A robust transportation infrastructure allows manufacturers to distribute their products quickly and inexpensively. Between 2009 and 2011, Missouri's national rank in transportation infrastructure was in the top nine. In 2012 Missouri ranked 20th. Missouri's current ranking of fifth best in the nation will be challenging to maintain as the State's annual transportation infrastructure spending has continued to decrease since 2011 due to a lack of funding.
- The Truck Reliability Index (TRI) is a reliability measure that is proposed to be used as a MAP-21 national freight performance measure. By comparing the TRI for each corridor year by year, MoDOT can determine if the corridor has become less or more reliable. A lower index for a succeeding year means reliability has improved with TRI of 1.0 representing perfect conditions. Calendar year 2013 values for the five major interstate corridors included: I-70(1.07), I-44(1.13), I-55(1.14), and I-35(1.11).² All of these values are relatively close to one, indicating a relatively high level of highway reliability based on current conditions, a strength Missouri should work to maintain.

Challenges

- Minimizing travel times and delays on the State's most traveled routes are essential to operating a reliable transportation system. The desired outcome for any route is a safe flow of traffic at the posted speed limit. From January to March 2014, it took drivers, on average, 12.75 minutes during the morning rush and 12.99 minutes during the evening rush to travel 10 miles on interstate routes in St. Louis. For interstates in Kansas City, it took drivers, on average, 11.14 minutes during the morning rush and 11.32 minutes during the evening rush to travel 10 miles. This is the equivalent of driving 50 mph.²

Individual roadways within St. Louis and Kansas City, however, experienced longer travel times than the regional averages. In St. Louis, this was true on I-64 and I-170 and in Kansas City on I-35 where average rush hour speeds on these routes were between 35 and 45 mph, respectively. In St. Louis, the heaviest recurring congestion existed on segments of I-64 (a.m. and p.m.) and on I-270 northbound (a.m.), while in Kansas City the heaviest recurring congestion occurred in the downtown region. Significant congestion also occurred in Kansas City on MO 291 north of the Missouri River (p.m.). In Columbia and Springfield, most traffic delays occurred on signalized arterials. For arterials, the most significant congestion occurred on Stadium Boulevard near I-70 in Columbia and on MO 13 (Kansas Expressway) near I-44 in Springfield during both the a.m. and p.m. rush hours. Travel time delays costs money for vehicles and drivers stuck in traffic and planning time so loads arrive on time.

Appendix C: Strengths and Challenges

- Recurring congestion occurs at regular times, although the traffic jams are not necessarily consistent day-to-day. Nonrecurring congestion is an unexpected traffic crash or natural disaster that affects traffic flow. When either occurs, the time required for a given trip becomes unpredictable. This unreliability is costly for commuters and truck drivers moving goods which results in higher prices to consumers.

The Kansas City and St. Louis metro regions both fall within the definition of larger urban areas where annual congestion cost totals are calculated. The annual congestion cost totals for commuters and freight in Kansas City show a slight decrease from 2007 (\$677M) to 2009 (\$578M) and a slight increase from 2010 (\$636M) to 2011 (\$640M). In St. Louis the measure shows a slight increase in 2008 (\$1.184M) and a slight decrease through 2010 (\$1.115M). The costs in Kansas City from 2007-11 were 21-30 percent below the national average for large cities. St. Louis was 20-32 percent above the national average.² Although these costs are below the national average, they still represent issues to address.

- St. Louis and Kansas City have demonstrated quick clearance of traffic-delaying incidents with yearly averages of 28.3 minutes and 27.3 minutes, respectively. However, average clearance times for St. Louis and Kansas City have generally increased since 2010.² Increased clearance time of traffic incidents increases congestion and slows freight movements.
- Interstates are the arteries that connect the country and keep commerce flowing. When interstates shut down in Missouri, the country is also disconnected. Sometimes nature and vehicle crashes affect MoDOT's ability to keep the interstates moving. Twenty-six complete closures or blockages occurred on I-70 in 2013, with 22 complete closures on I-44 in 2013. The length of closure and location of these closures varied with the majority being attributed to vehicle crashes.²
- Despite a significant investment in major bridges longer than 1,000 feet, the number of structures in good condition generally dropped over the five-year period while the number in fair condition significantly increased. This is reflective of MoDOT's aging bridge population with many structures at the point where they need minor maintenance or rehabilitation. In addition, there are 4,849 load restricted bridges in Missouri or approximately 20 percent of all bridges in the State.² This indicates that Missouri's infrastructure is aging and will require additional investment for repairs in the future with limited funds available.
- Stakeholders believe it is a challenge to monitor and focus rail operation upgrades when this asset is owned and operated by private entities that have to consider impacts on profits.
- In the Northwest and Northeast districts rail lines were removed, which hinders economic development in these areas. Coordination with the rail companies is needed and a different solution than removal of rail lines is needed.
- The majority of the locks and dams on the Mississippi River were constructed in the 1930s and are showing their age. The seven locks and dams in or near Missouri are a part of the Upper Mississippi River, starting just north of St. Louis and extending to the Iowa border. The locks and dams are in need of major rehabilitation or replacement which is an expensive undertaking.

The maintenance needs of the aging infrastructure are increasing at a rate much greater than the operations and maintenance funding provided for the system, which adversely affects reliability of the system. Long-established programs for preventive maintenance of major lock components have essentially given way to a fix-as-fail strategy, with repairs sometimes requiring weeks or months to complete. Depending on the malfunction, extended repairs can have major consequences for shippers, manufacturers, consumers, and commodities investors.

- Stakeholders believe that the failure to dredge and maintain navigable channels on both the Missouri and Mississippi Rivers is a problem. From the 1930's to the 1960's, six dams were constructed on the Missouri River, creating the largest reservoir system in the U.S. Missouri has an interest in the river as a source of drinking water as well as recreation, power generation, water supply, river commerce, and fish and wildlife.³ Regulations determine how much water is stored, mainly in the upper three reservoirs in Montana, North Dakota, and South Dakota. This then determines what water flows exist for the Missouri River and often creates drastic fluctuations in water levels that prevent reliable navigation. Missouri's position is that water flows should be maintained at levels that allow for reliable navigation.
- At ports throughout the State, increased maintenance activities are needed on both the land and water sides of the operations.
- Numerous emerging ports have been identified throughout the State. Support for their development is needed.

Appendix C: Strengths and Challenges

- The Springfield Airport (SGF) has been identified by the Federal Aviation Administration as an airport that may have its tower hours reduced. Having reduced hours would reduce the number of flights in and out of SGF, which would affect the amount of freight that could come through the airport as well.

Safety

This section discusses the safety strengths and challenges on the State's freight system. These strengths and challenges are associated with the numbers of Commercial Motor Vehicle (CMV) crashes, rail crossing issues, and other safety-related issues.

Strengths

- Roadway safety improvements helped reduce overall roadway fatalities from 1,200 in 2005 to less than 800 in 2013, the lowest since the 1940s.⁴ This in turn limits back-ups and congestion caused by crashes, resulting in less delay to freight truck traffic, as well as reducing the cost of crashes and fatalities.
- The number of CMV fatal crashes through the fourth quarter of 2013 was 82. Even with reduced resources, this is 22 fewer than reported in 2012, a 21.1 percent decrease. Between 2009 and 2013, fatal crashes involving a CMV decreased by 8.9 percent.² A reduction of fatal crashes limits back-ups and congestion, with less delay for freight truck traffic.
- The number of CMV serious injury crashes reported through the fourth quarter of 2013 was 311. This number is 17 more than reported in 2012, an increase of six percent. However, between 2009 and 2013, CMV serious injury crashes decreased by 18 percent.² Missouri needs to continue with efforts that help further reduce CMV crashes.

Challenges

- Diminished funding will hamper MoDOT's ability to make significant safety improvements in the future.²
- Key safety issues include the lack of safe truck parking, numerous at-grade rail crossings, and roadway design and geometric improvements to facilitate safety. A lack of truck parking can discourage companies from doing business in the area.
- At-grade rail crossings can be a problem, and crashes at these locations can cause back-ups and congestion that delay both rail and truck traffic.
- The top three interstate and US/MO routes with the highest three-year CMV crash rates are listed in **Table C-2**. This is a challenge because crashes can cause back-ups and congestion that delay freight truck traffic and potentially cause loss of life and property.

Table C-2: Top Interstate and US/MO Route CMV Crash Rate Locations

Interstate Segment	Direction	To	From
I-55	North	I-44	I-70
I-55	South	I-70	I-44
I-29	South	I-435 (north)	I-35 split
US/MO Route Segment	Direction	To	From
MO 13	South	I-44	US 60
MO 210	East	I-435	MO 291
MO 13	North	US 60	I-44

Source: MoDOT crash data

- Stakeholders indicated that at-grade rail crossings throughout the State present a safety issue and that improvements at all at-grade rail crossings with safety issues are needed. In 2011 and 2012 Missouri had 50 highway-rail incidents each year, while in 2013 the number of highway-rail incidents was 53.⁵

Appendix C: Strengths and Challenges

Connectivity

This section discusses the strengths and challenges of connectivity across the Missouri freight system. These strengths and challenges are in relation to both connectivity between modes, as well as connectivity across the State.

Strengths

- Missouri is a “crossroads for the continent.” Missouri’s central location in the U.S. was consistently identified as a top strength of the State’s freight system and an asset for attracting new business.
- The Panama Canal is now undergoing a \$5.25 billion expansion to be completed in 2015. The completion of the Canal will enhance one of the most important trade links in the world by linking the Atlantic and Pacific Oceans. When the Canal expansion is complete the new locks will allow for deeper, longer and wider vessels, doubling its existing throughput capacity.¹ Reduction of transportation costs due to Canal expansion could affect the movement of goods on inland waterways in two ways. First, a reduction in ocean transportation costs out of Gulf ports due to the use of larger, more efficient ships will reduce aggregate costs of exporting bulk commodities, such as grain, by the Mississippi River route rather than by rail through Pacific Northwest ports. Second, lower transportation costs attributable to expansion of the Canal could increase export volumes as the transportation element of U.S.-produced commodity costs helps to make U.S. exports more competitive in world markets. While the scale and timing of the impacts to Missouri freight flows is unknown at this time, it is anticipated that the expansion will change international trade flows and change the demands on transportation networks, service, and operation.

All of these growth factors will likely lead to a growth in freight movements within Missouri. The growth in freight movements will result in increasing demands on the highways, rail lines, port facilities and airports handling air cargo freight. The completion of the Panama Canal expansion project may alter some shipping patterns. If shipping costs remain competitive and carriers can be responsive to customer demands, then the markets could foster changes in some supply chains to include increased imports and exports throughout southern and eastern U.S. ports.⁶

- The Missouri River and the Mississippi are key assets to Missouri based on their central location in the U.S. and that the Missouri River and the Lower Mississippi River are lock free.
- The Kansas City metropolitan area is one of the largest rail freight and trucking hubs in the country. These are important resources to build upon.
- Southwest Missouri is experiencing large growth in manufacturing from the KCS, BNSF, and the multiple interstates leading to Mexico and the Gulf.

Challenges

- Not all modes are readily accessible and well connected with other modes (i.e. rail to water ports). A high priority project that will look to fix this issue is the New Bourbon Port connection from the port to I-55 and a rail connection to St. Francois County.
- Major freight generator sites have been identified throughout the State. Connectivity to these sites is a key issue, including the last mile connections to encourage continued use of these sites and future growth
- Future growth is threatened by railroads closing local crossings and spurs, and also removing scales.
- There is no program or funding to provide last mile connections for rail access. Class 1 Railroads invest millions into maintaining the tracks for through traffic, but the spur connections or last mile connections into specific sites are the biggest challenge for both freight movers and public agencies.

Current Freight System Deficiencies Related to Freight Plan Goals

This section provides an assessment of the current state of Missouri’s freight system and how the system measures up to the goals and objectives identified for the freight plan.

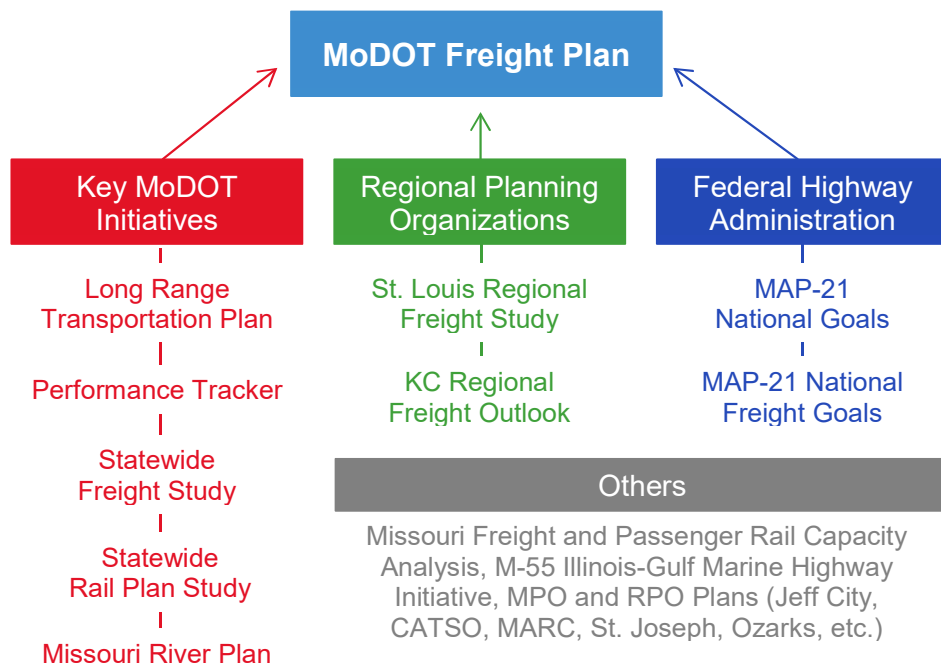
A critical component of creating the freight plan is the development of goals and objectives that will help MoDOT prioritize projects and guide investment decisions. The freight plan goals were not created in isolation; but their development was informed by, and aligned with, other state plans and national policies that already exist or are in development. Specifically, the freight plan goals are consistent with:

Appendix C: Strengths and Challenges

- Moving Ahead for Progress in the 21st Century Act (MAP-21)
- Key MoDOT Initiatives
- Other Regional and Statewide Plans with a Freight Component

While these plans and policies provide the basis for establishing the freight plan goals, stakeholder input was also integrated into their development. Additionally, **Figure C-1** illustrates some of the considerations used in establishing the freight plan goals.

Figure C-1: Considerations into the MoDOT Freight Plan Goals



After examining the strategic frameworks from relevant State plans including *Vision for Missouri's Transportation Future*, other State and regional plans, and the new federal requirements as defined by MAP-21, MoDOT determined that the goal areas developed for the Long Range Transportation Plan should also be adopted as the freight plan goals. The resulting four pillars driving transportation decisions are maintenance, safety, economy and, connectivity/mobility. There are three strategic areas that build upon these four pillars from *Vision for Missouri's Transportation Future* that are also being considered, including environmental, organizational and process, and customers and partners.

The objectives listed below by goal were developed in order to meet the needs identified from stakeholder input and a review of other plans with a freight component.

Maintenance

The maintenance goal aims to ensure that the freight system is maintained in good condition by:

- Keeping the highways and bridges in good condition
- Supporting and encouraging the maintenance of railways, waterways, airports, and multimodal connections

While MoDOT is currently exceeding their goals for highway and bridge maintenance, the number of awards to contractors has dropped due to a lack of funding. Without enough funding it will be increasingly difficult to maintain the current condition for not only highways and bridges, but all freight modes. The number of highway miles that Missouri must maintain and the age of some of the facilities from highway and rail bridges to outdated airport facilities and lock and dams are a challenge to meeting this goal.

Safety

Appendix C: Strengths and Challenges

The safety goal looks to improve safety on the freight system by:

- Decreasing the number and severity of crashes involving CMVs
- Improving safety at railroad crossings

While the instance of CMV crashes has trended downward, highway-rail crossing incidents have slightly increased over the last several years. MoDOT continually strives to decrease the numbers and severity of these incidents across all modes. However, diminished funding will hamper MoDOT's ability to make significant safety improvements in the future. Key challenges to the safety goal include lack of safe truck parking, numerous at-grade rail crossings and roadway design and geometrics that are in need of improvement.

Economy

The economy goal supports economic growth and competitiveness and job growth in Missouri by:

- Improving the economic competitiveness in Missouri through improvements to the freight system
- Enhancing and supporting opportunities for economic development and job growth through improvements to the freight system

While the cost to ship several of Missouri's major export commodities (e.g., soybeans, automobiles and chemicals) is relatively low compared to competing states, MoDOT has only recently begun quantifying and calculating this measurement of goods movement and competitiveness. The bulleted items above have been identified as performance measures in the freight plan and will continue to be monitored in relation to meeting economic goals. Challenges to economic growth and competitiveness, as it relates to freight, include the need to upgrade aging facilities, travel delays that cost shippers time and money, and the need to support growth beyond truck and rail, including areas such as air cargo and waterways and port development.

Connectivity and Mobility

The connectivity and mobility goal seeks to improve the connectivity and mobility of the freight system throughout the State by:

- Improving the multi-modal connectivity of the freight system
- Reducing congestion and increasing reliability on roadways
- Supporting and encouraging improved efficiency of rails, waterways, and airports
- Improving connections to freight generators

While the amount of total freight tonnage in Missouri has increased over the last several years, MoDOT has only recently begun measuring annual hours of truck delay and calculating the truck reliability index. These parameters have been identified as performance measures in the freight plan and will continue to be monitored in relation to meeting the connectivity and mobility goal. Key issues in meeting the connectivity and mobility goal include cutting down on the number of accidents and congestion that can cause delays or stop movement altogether, the lack of accessibility and connection between modes, the need to maintain or improve last mile connections to major freight generator sites and the threat of closures of local rail crossings and spurs.

Next Steps

Identifying the strengths and challenges, as well as which goals are not being met, are a vital part of the overall MoDOT freight plan development effort. This information will be used as input in project identification, selection, and prioritization. The strategies and implementation plan for the freight plan were developed to address the strengths and challenges in collaboration with stakeholders and other Missourians.

Appendix C: Strengths and Challenges

References

- ¹ CDM Smith for MoDOT, Goals and Performance Measures Technical Memorandum, Missouri State Freight Plan, July XX, 2014
- ² Missouri Department of Transportation, Tracker Report, April, 2014
- ³ http://www.dnr.mo.gov/env/wrc/interstwttrs/missouri_river.htm
- ⁴ Missouri Department of Transportation, Missouri's Declining Investment in Transportation Handout, June, 2014
- ⁵ <http://safetydata.fra.dot.gov/officeofsafety/publicsite/Query/stchart.aspx> , July 15, 2014
- ⁶ U.S. Department of Transportation, Panama Canal Expansion Study – Phase I Report, November, 2013.

Appendix D: Stakeholder Outreach

During the creation and implementation of this State Freight Transportation Plan, key freight stakeholders provided feedback which helped MoDOT make decisions and form recommendations. Stakeholders were vital in the creation of this plan and MoDOT remains committed that stakeholders will be involved in all future freight planning work.

Introduction

Hundreds of freight stakeholders representing different freight modes and areas of the State were involved in creating this Freight Plan and the creation of a framework to identify strategic investments in the system that would bolster Missouri's economy.

Efforts focused on encouraging stakeholders such as logistics directors, carriers, shipping managers, economic development professionals and leaders of private industry to be involved in each step of creating this plan. All outreach activities were guided by the Freight Steering Committee made up of key stakeholders and MoDOT leadership.

Goals of stakeholder outreach were to:

- Better understand, as an agency and as a State, what the costs are to Missouri's economy if our freight network stagnates or deteriorates.
- Articulate what freight projects would be most helpful to the State if additional funds were made available.
- Collect thoughts on making businesses and communities more competitive - whether through improvement projects or policy changes.

Throughout the State, stakeholders provided input through:

- Electronic and paper surveys and comment forms
- In-person and phone interviews
- Multiple rounds of forums/webinars.
- Direct/grassroots outreach.

Statewide Themes

Several reoccurring themes consistent throughout the State emerged early during stakeholder outreach including:

- Missouri has long been a center of trade. From its rivers to rails, highways and airways, Missouri is a freight hub.
- We heard that, yes, Missouri generally has a well-connected road network but when 'hiccups' like a crash, weather or construction occur, there isn't

50+

Key Stakeholder Interviews

60+

Surveys

150+

Attendance at 7 District Forums

100+

Attendance at 3 Priorities & Investments Forums

500+

Stakeholders reached out to through grassroots events

Steering Committee

composed of key stakeholders who guided the outreach process



Appendix D - Stakeholder Outreach

enough resiliency to keep the system flowing and transport slows or stops.

- There is also a strong voice for increasing the capacity and maintenance of the existing network, including along I-70 and I-44.
- We heard that more rail connections are needed from the network to centers of industry. Many grade crossing improvements and separations are needed to increase safety.
- We also heard that Missourians are interested in increasing utilization of our waterways. There is particular interest in waterway solutions that focus on container handling and harbor dredging.

Initial Two-Way Understanding with Stakeholders

Work kicked off on this Freight Plan during November 2013 and stakeholders were asked to participate in the very early stages.

Freight Steering Committee

Freight Steering Committee members included freight and State leaders and select members of MoDOT leadership and staff. The committee convened monthly. It provided feedback on the plan at project milestones, reviewed materials, represented a diverse group of freight interests, and helped connect MoDOT to other stakeholders. Steering Committee members included:

- Tom Crawford, Missouri Trucking Association
- Chris Gutierrez, KC SmartPort
- John Ferguson, Pemiscot County Port Authority
- Mike Hemericks, Missouri Department of Economic Development
- Ben Jones, Union Pacific Railroad
- Chris Klenken, Missouri Department of Agriculture
- David Lancaster, Lambert International Airport
- Kevin Ward, Federal Highway Administration
- Mike Kearney, Ameren UE

MoDOT Steering Committee members included:

- Kathy Harvey, Chair
- Michelle Teel, Multimodal
- Machel Watkins, Planning
- Scott Marion, Motor Carriers
- Becky Baltz, Southwest District
- Tom Blair, St. Louis District
- Joe Jones, Policy
- Bob Brendel, Customer Relations
- Dan Niec, Kansas City District

Ex-officio MoDOT Steering Committee Members included:

- Dave Nichols, Director
- Ed Hassinger, Chief Engineer
- Roberta Broeker, CFO

Appendix D - Stakeholder Outreach

Key Freight Stakeholder Interviews and Surveys: Results and Analysis

To initiate stakeholder involvement, MoDOT identified 96 contacts in freight-related services including manufacturing, economic development, logistic and carriers to be interviewed regarding the strengths, weaknesses and needed investments in the freight network. An email invitation announcing the project was distributed with the Plan fact sheet to familiarize stakeholders with the launch of the Plan. The project team followed up with phone interviews. In total, 53 interviews were conducted and an electronic survey tool was used to track responses. The following is a list of interviewees categorized by MoDOT District.

Table D-1: Stakeholder Interviews Conducted by MoDOT District

Organization	Contact	MoDOT District
Fort Leonard Wood	Richard Tharp	Central
Gallup Trucking	Jamie	Central
Greater KC Chamber of Commerce	Kristi Wyatt	KC
Kansas City EDC	Pete Fullerton	KC
KC SmartPort	Chris Gutierrez	KC
KC Southern Railroad	Kevin McIntosh	KC
TranSystems	Sara Clark	KC
Wagner Logistics	John Wagner	KC
Mid America Regional Council	Mell Henderson	KC
Lewis County-Canton Port Authority	Bill Smith	NE
Marion County Port Authority	George Walley	NE
Mid-America Port Commission	Charles Bell	NE
Orscheln Industries	Richard Powers	NE
Pike/Lincoln County Port Authority	Carolyn Wisecarver	NE
Boonslick Regional Planning Commission	Chuck Eichmeyer	NE
Altec	Tom Richmond	NW
Kawasaki Motors Manufacturing	Steve Bratt	NW
Nodaway County Economic Development	Lisa Macali	NW
St. Joseph Regional Port Authority	Brad Lau	NW
Bootheel Reg. Planning & Econ. Devel. Commission	Steve Duke	SE
Cape Girardeau Area Chamber of Commerce	John Mehner	SE
New Bourbon Regional Port Authority	Ron Steele	SE
New Madrid County Port Authority	Timmie Hunter	SE
Orgill	Denny Koonce	SE
Ozark Foothills Regional Planning Commission	Andrew Murphy	SE
Pemiscot County Port Authority	David Madison	SE
SE MO Reg. Planning & Econ. Develop. Commission	Chauncy Buchheit	SE
Southeast Missouri Regional Port Authority	Dan Overbey	SE
Western Dairy Transport	Drew Honeycutt	SE
AEP River Operations	George Piccioni	STL
ARCO	Tracey Ball	STL
City of St. Louis Port Authority	Nick Nichols	STL
Davidson Surface and Air	Jason Schrum	STL

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Jefferson County Port Authority	Janice Luchan	STL
North County Inc.	Rebecca Zoll	STL
Transportation Club of St. Louis	Brad Reinhardt	STL
Monsanto	Duane Simpson	STL
St. Louis Economic Development Partnership	Doug Rasmussen	STL
St. Louis Regional Chamber	Louis Copilevitz	STL
Associated Wholesale Grocers, Elite Logistics	Todd Smith	SW
Jared Enterprises	Curtis Jared	SW
Joplin Area Chamber of Commerce	Rob O'Brian	SW
Joplin Regional Partnership	Kevin Welch	SW
O'Reilly Auto Parts	Brian Roesler	SW
Springfield Branson National Airport	Brian Weiler	SW
Springfield Chamber of Commerce	Jeff Seifried	SW
Springfield Chamber of Commerce	Larry Snyder	SW
Wil Fishcher Distributing Co.	Mary Cooper	SW
Associated Industries of Missouri	Ray McCarty	Statewide
BNSF	Darrell Coffey	Statewide
Dysart Taylor	Kenneth Hoffman	Statewide
Missouri Agricultural and Small Business Development Authority	Tony Stafford	Statewide
Missouri Chamber of Commerce	Dan Mehan	Statewide
Missouri Farm Bureau Federation	Estil Fretwell	Statewide

Additionally surveys were sent to other stakeholders.

Both interviews and surveys fall into four separate categories, and questions were tailored to each of the four groups: industry leaders; economic development professionals; general freight stakeholders and interested public; and motor carriers, shippers and receiver representatives. Each of the survey results (that includes the interviews) are available in Attachments 1, 2, 3 and 4.

All interviews and surveys included the following three questions:

- What are the greatest strengths of Missouri's freight network?
- What are the biggest challenges for Missouri freight in the next 5 to 10 years?
- If you had a blank check to provide the greatest improvement to Missouri freight transportation, where would you spend the money?

Additionally, surveys were emailed directly and made available on the website for input from the general public. The responses were analyzed from a statewide and district-specific perspective.

The surveys conducted served as a baseline for the project team for stakeholder involvement. There were some themes that evolved during the entire stakeholder involvement process. An example of this is that in these surveys most of those interviewed did not indicate that connectivity was important for the Districts and the State. However, during further discussion at forums and grassroots outreach events, connectivity through freight networks and modes was identified as a priority.

Appendix D - Stakeholder Outreach

District Freight Forums (January-February 2014)

Building upon the stakeholder interviews and surveys, freight forums were held in each MoDOT district to discuss freight issues and opportunities with a broader set of freight stakeholders. Forum locations included:

- Kansas City
- St. Louis
- Sikeston
- Jefferson City
- St. Joseph
- Springfield
- Hannibal (*held as a webinar due to weather cancellation)

In all, more than 150 stakeholders participated in these discussions and provided valuable feedback to plan efforts.

A narrated presentation from the forums was also posted to the project website to start discussions with those stakeholders unable to attend. A copy of the presentation is provided in Attachment 5.

District summaries based on the results from the forums were created and are presented in Attachments 6-12.

Statewide Themes

During the District forums several overarching, statewide themes emerged including:

- Capacity upgrades to I-70 are a top priority. Additional lanes were suggested to provide better reliability along the corridor.
- Missouri generally has a well-connected and functioning road network until there is a hiccup, such as congestion, weather or construction. Stakeholders also identified a need for capacity and maintenance improvements to maintain reliability of interstates and minor routes.
- Missouri is a “crossroads for the continent” and has a vast freight network that is an asset for retaining existing businesses and attracting new business. Stakeholders voiced concern that not all modes are readily accessible and well connected with other modes (e.g. rail to water ports) and that work needs to be done to integrate the freight modal networks.
- There is a need to engage additional stakeholders to help guide the freight plan. Previous efforts have lacked private sector engagement. Over the last several years MoDOT has collaborated with several private sector groups on successful projects. This is an opportunity to build on those relationships, share information and continue to collaborate.

Figure D-1: Number of stakeholders in attendance at each district freight forum.

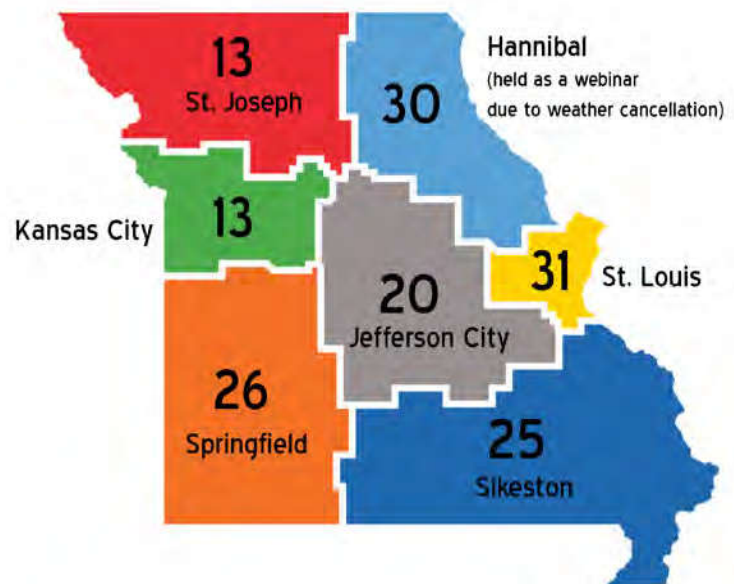


Figure D-2: Statewide themes heard from stakeholders in District forums

What have we heard during outreach across the state?



Generally, well-connected road network, but...



Connect all freight modes



Engage all stakeholders



Utilize waterways



Appendix D - Stakeholder Outreach

- Investigate possibilities for utilizing waterways. Stakeholders see potential for growth on the Missouri and Mississippi Rivers but consistently brought up concerns including frequency of dredging, lack of improvements to the lock and dam system and inconsistent water levels. The expansion of the Panama Canal was also mentioned by stakeholders who want to make sure the state is positioned to take advantage of potentially increased freight flow and remain competitive. Stakeholders are concerned about low water levels and the impacts to operations if dredging frequency decreases.
- Appropriately funding freight transportation projects is a key stakeholder concern. Stakeholders voiced a need to preserve the existing freight network and systems, but also said that improvements and enhancements are keys to growing the state's economy.

District Themes

Themes also emerged in each District. They include:

Northwest District

- Farm-to-market routes are essential to the region's economy. Rail access in this region is decreasing, so state-maintained lettered routes are very important, not only for moving agriculture goods, but also as connections for manufacturers to highways and interstates.
- Road capacity upgrades are important in the region. Despite I-70 passing outside of the District to the south, stakeholders indicated that it should be improved to a six-lane facility. Stakeholders also suggested increasing capacity to four lanes between I-29 and I-35 through Maryville. US-36 is an important corridor for business owners and should be considered for interstate designation. One private truck freight fleet operator called US-36 a "national best-kept secret." He explained that it is a safer route and that it saves his drivers an hour in drive time to Indianapolis.
- There is a dwindling rail presence in the district. Stakeholders pointed out that there were more freight rail options in the past and many of those options no longer exist in the District.
- Economic development efforts, such as the Eastowne Business Park in St. Joseph, need adequate roadway access. In addition, food industry businesses, such as Farmland Foods, could benefit from investment in intermodal access.
- Low water levels and water quality in the district and throughout the State concern stakeholders, as does local funding for the port.

Northeast District

- Capacity expansion and maintenance of highway networks are essential to ensuring network reliability. Specific examples of maintenance issues provided by stakeholders included US-36 from Shelbina to Hunnewell and Monroe City and along US-61 between Palmyra and Hannibal. Road surfaces in many sections are "rougher than a cob." Capacity issues include too much truck traffic on I-70, and bottlenecks on US-61 in Hannibal and on the I-70 interchange in Warrenton.
- Future growth is threatened by a dwindling rail presence in the District.
- Locks and dams along the Mississippi River need improvement. Port stakeholders in this region mentioned the deteriorating condition of the lock and dam system as a challenge for Missouri freight in the future.

Kansas City District

- The Kansas City community is proud of its status as one of the largest rail freight and trucking hubs in the country. Stakeholders commented that integrating different freight modes is important regionally and nationally. Assets in this district include a rapidly growing Foreign Trade Zone and the BNSF multi-modal facility located across the state line in Kansas, which will have the largest speculative space in the country.
- Capacity upgrades to I-70 are a top priority in the Kansas City District as well as across the State. The importance of the I-70 corridor to freight movement is echoed throughout all of the districts. Additional lanes were suggested to provide better reliability along the corridor. Other top priority corridors identified included I-49 and the south leg of I-435.
- Private sector engagement is a crucial part of crafting a meaningful freight plan. Stakeholders suggest that key businesses, including railroads, should be brought into crafting the plan and that the best way to do that is through cultivating relationships and building trust. In addition, information on private sector freight movements that has not

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been available in the past is needed for a complete freight picture and a plan that enhances economic development in the State.

- The increase in the use of e-commerce is changing the way that freight stakeholders conduct business and will require a freight system that accommodates that shift. Stakeholders pointed out that more distribution centers will lead to greater pressure on roadways.

St. Louis District

- St. Louis is challenged to compete as a freight hub, and focus should be placed on developing opportunities for intermodal activities and international export. Stakeholders said transforming St. Louis to a major freight hub status is needed to grow the regional economy. While “St. Louis tends to be a pass-through,” there are opportunities to develop additional facilities, particularly as an alternate freight hub to Chicago, which is highly congested. Stakeholders would like the public to be better informed on how freight transportation infrastructure supports the economy and jobs.
- Congestion on I-70 and I-44 causes costly delays and some safety concerns.
- It is difficult to move freight from ports and airports directly to destinations. Better connectivity is needed between the freight modes. Stakeholders are concerned about the difficulty businesses have in making the “last-mile connections.” This issue was recently raised when trying to attract large economic development deals to the region.
- Air cargo facilities are available at Lambert Airport, but they are dated and small. Upgrades and expansion efforts are needed for air cargo capacity growth in the District.
- Deficient bridges in the district could cause costly delays and pose safety concerns for carriers.
- There is a shortage of available motor carriers and truck fleets as it is becoming increasingly difficult to recruit and insure drivers, and many fleets have left St. Louis. These shortages are driving up costs to move freight on roadways.

Central District

- Innovative funding options should continue to be explored. Stakeholders in this district are concerned that funding gaps are threatening programs that are working well, such as MoDOT’s cost share program.
- Efforts should be made to improve connectivity throughout the district. Stakeholders identified a need for improving north-south connections and specifically noted concerns with US-63 between Jefferson City and Rolla. The district could also benefit from improvements to I-70, such as increased lanes, as the interstate is critical to moving freight and supporting the agriculture industry. Several stakeholders suggested that a multi-modal hub between Columbia and Jefferson City would support economic development in the district.
- The Missouri River is under-utilized and under-marketed. Stakeholders recognize that the district should expect increased demand over the next five years and beyond. Utilizing waterways will be critical in effectively moving additional freight and taking strain off of highways and rail lines.
- The freight system needs to support the agriculture industry, which is key to the economic success of the district and the State. As one stakeholder noted, “2014 agriculture industry technology is being moved on a 1940’s (freight) network.”

Southwest District

- Interstate capacity upgrades are needed. Many stakeholders suggested adding lanes to I-70 and I-44. “I-44 is aging out and will need additional capacity as the population increases in the region.” Congestion on these interstate corridors is a top concern for many, especially in urban areas. One stakeholder recommended completing I-49 to the Arkansas state line.
- Motor carrier accommodation and recruitment is a high priority in this district. A recurring theme from stakeholders is the need for better accommodations for motor

Figure D-3: Stakeholders and MoDOT come together in MoDOT’s Southwest District to discuss strategic freight investments.



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carriers, such as improved and larger rest areas. In addition, stakeholders are interested in motor carrier recruitment, driver training programs for the general public to increase safety on roadways, and less regulation on drivers.

- Funding programs for freight should be flexible so each district can target their specific needs, regardless of mode.

Southeast District

- East-west connectivity is limited regionally and a St. Louis bypass could help congestion. Capacity concerns in the St. Louis area led many stakeholders to suggest an east-west or diagonal corridor to provide “this area a direct route through central Missouri” as an alternative to the longer I-55/I-70 route. Another interviewee said Missouri “needs an ‘X’ through the middle of the state to connect southeast Missouri with Kansas City and Kirksville to Joplin and Springfield.” Stakeholders also suggested a freeway-type roadway (i.e. four-laning US-60 across the state).
- US-67 is a key north-south connection, and completing the route through Arkansas would increase economic opportunities.
- Industry relies on secondary highways for time-sensitive delivery and connections to interstates, and the condition of these roadways could be improved. Several stakeholders suggested resurfacing and capacity upgrades.
- Stakeholders are concerned about funding for ports and waters for small-level capital projects. Additionally, several stakeholders commented about the need for consistent support of harbor dredging.

Additional Communication Tools and Outreach Efforts

- MoDOT worked to broaden and update its freight stakeholder database throughout the life of the project and added new key stakeholders. There are over 1,300 entries.
- Project email blasts were sent throughout the project, inviting key stakeholders to participate in forums and surveys.
- An interactive website and social media accounts were maintained throughout the project and included invites to events, press releases and project materials. The website address is MOFreightPlan.org and the twitter handle is @mofreightplan. As of the end of July the website received over 3,000 total page views.
- Several short videos were created by MoDOT during the project and focused on providing project information and drawing the link between freight and economic developments.

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Deepen Stakeholder Connections

Grassroots Outreach

MoDOT also reached out to motor carriers, shippers and receivers in the state to gather input via an electronic survey. Because the response rate was limited, MoDOT began reaching out directly to freight-orientated groups and associations to hear members' thoughts and concerns regarding the freight plan. Presentations were made to groups and surveys were provided.

The groups include:

- Mid Missouri Regional Planning Commission
- Missouri Chamber of Commerce and Industry
- Springfield Area Chamber of Commerce
- Greater Kansas City Chamber of Commerce
- Missouri Trucking Association
- Missouri Chapter of Association of American Railroads
- Council of Supply Chain Management-St. Louis
- St. Joseph Chamber of Commerce
- Consortium for Supply Chain Management Studies
- Transportation Club of St. Louis
- Inland Rivers, Ports and Terminals (IRPT)
- Joplin Diplomats
- Springfield Motor Carriers
- Transportation Engineers Association of Missouri (TEAM)
- KC Aviation Department

Figure D-4: Stakeholders talk about investments in all modes in St. Louis



Regional Priorities and Investment Forums (April-May 2014)

Close to 100 stakeholders participated in three regional forums held in Kansas City, St. Louis and Springfield. A statewide focused webinar was also held in early May for those stakeholders who were not able to participate in any of the three regional forums.

The primary question stakeholders were asked to help answer was: How can MoDOT best prioritize investments to achieve the freight network goals?

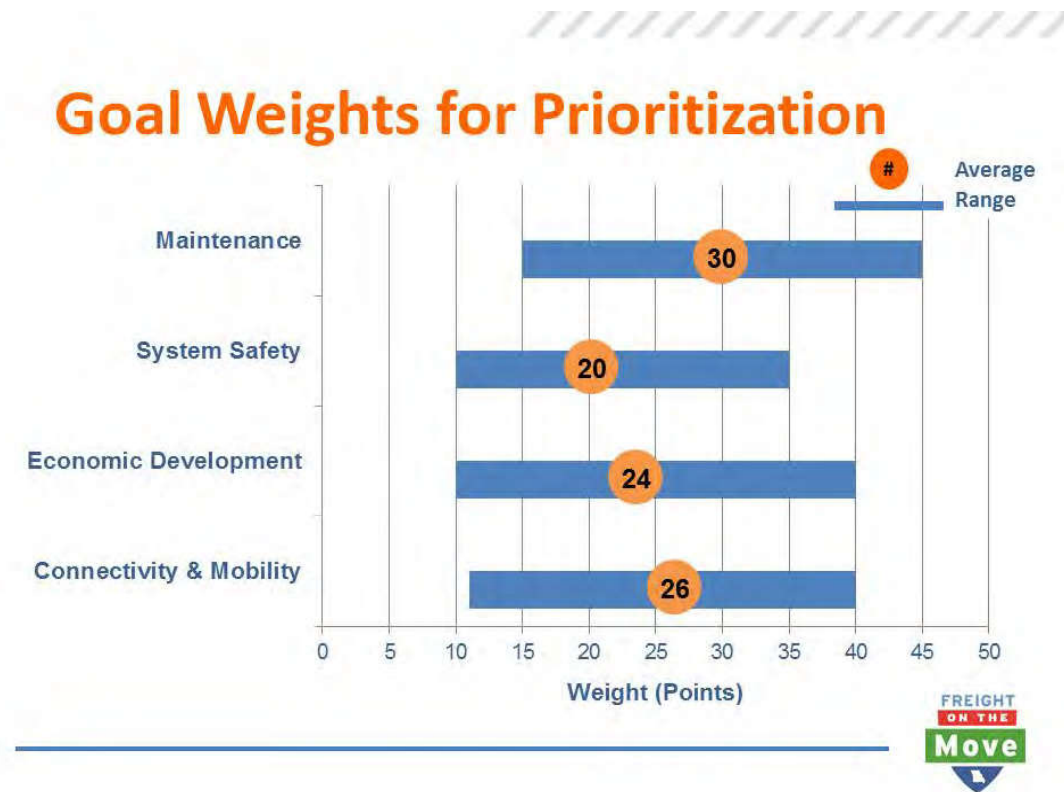
To answer that question, MoDOT provided stakeholders with information about the current condition of the freight network. Then stakeholders were asked what freight assets are needed today and in the future to be more competitive. Three interactive exercises were completed within a small breakout group format during the forums so that stakeholders could provide guidance to MoDOT on how to best prioritize freight improvement projects.

First, small groups discussed how goals for the freight plan, which are aligned with MoDOT's long range transportation plan goals, should be prioritized and weighted when considering freight projects. Those goals are maintenance, system safety, economic development, and connectivity and mobility.

The statewide average weight for each goal is identified in the orange circle in **Figure D-5**. The blue bar represents the range of weights assigned to each goal by the small groups across the State.

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Figure D-5: Stakeholders assigned goal weights for project prioritization



The small groups were then asked to weight the filters (or selection criteria) that would be used to prioritize freight improvement projects for each goal. Those filters are identified by goal below and results are provided in Figure D-6:

Maintenance Filter:

- Maintains the existing freight network.

System Safety Filter:

- Improves a high crash location.

Economic Development Filters

- On a link of high economic value.
- Connects economically distressed areas.
- Improves access to freight generator.
- Expands or modernizes facilities to support freight.
- Adds capacity to the system.

Connectivity and Mobility Filters

- Improves first/last mile connections.
- Removes or improves bottlenecks.
- Addresses substandard infrastructure.

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Figure D-6 provides the average weighting statewide for each filter (or criterion). Like **Figure D-5** above, the number in the orange circle represents the statewide average and the blue bar represents the range of weights for each criterion.

Figure D-6: Stakeholders assigned filters and weights for each of the goals for project prioritization.

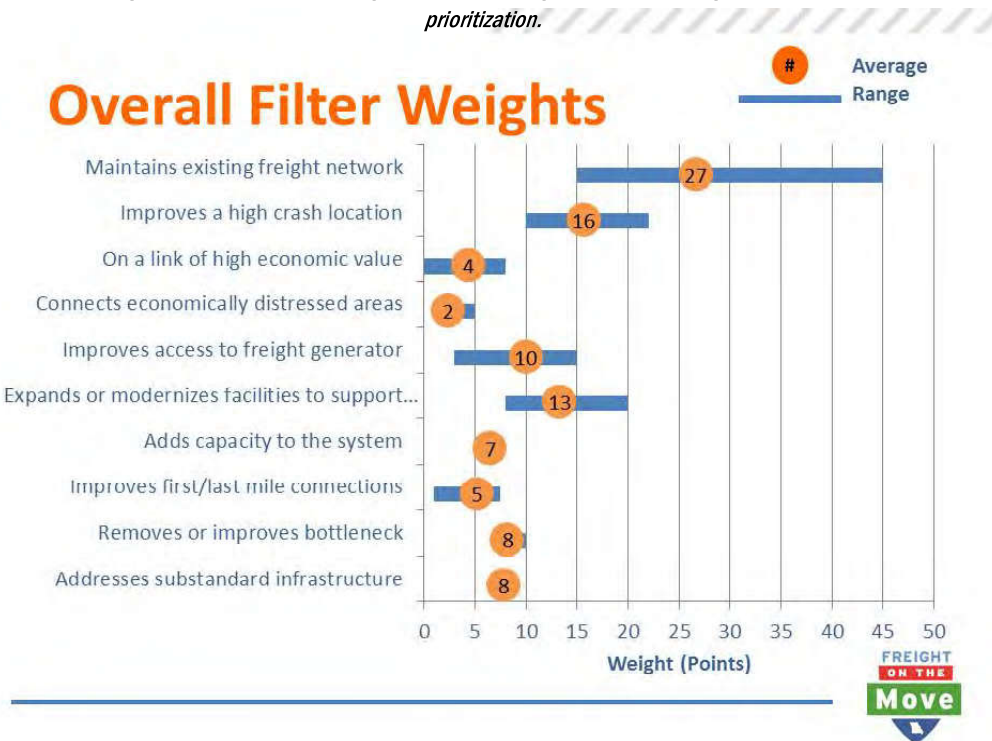


Figure D-7: Kansas City Stakeholders talk through project prioritization



Appendix D - Stakeholder Outreach

Stakeholder Comment Period (October 2014)

A draft State Freight Plan was available for public comment from October 1 to 31, 2014. Stakeholders submitted 80 comments during this time via the following outreach activities:

- An online survey targeting key stakeholders was posted on the State Freight Plan website to gather input about the draft plan. Nineteen responses were received. A copy of the survey and the responses are provided in Attachment 15.
- Outreach events were held and project team members facilitated discussions and presented information on this plan. A list of the outreach events is provided in Attachment 16.
- A webinar presenting highlights from the plan was held on October 19 during which participants could provide comments. The presentation used during the webinar was posted to the project website and is available in Attachment 17.

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Attachments:

Interviews/Surveys

1. Freight Industry Survey
2. Community Leaders Survey
3. Motor Carriers, Shippers and Recievers Survey
4. General Stakeholder/MoFreight.com Survey

Freight Forum Presentation

5. Statewide Presentation

District Freight Forum Summaries

6. Central District
7. Kansas City District
8. Northeast District
9. Northwest District
10. St. Louis District
11. Southeast District
12. Southwest District

Priorities and Investment Forum Presentation

13. Statewide Presentation

Business Forum Summary

14. Final Document

Stakeholder Comment Period

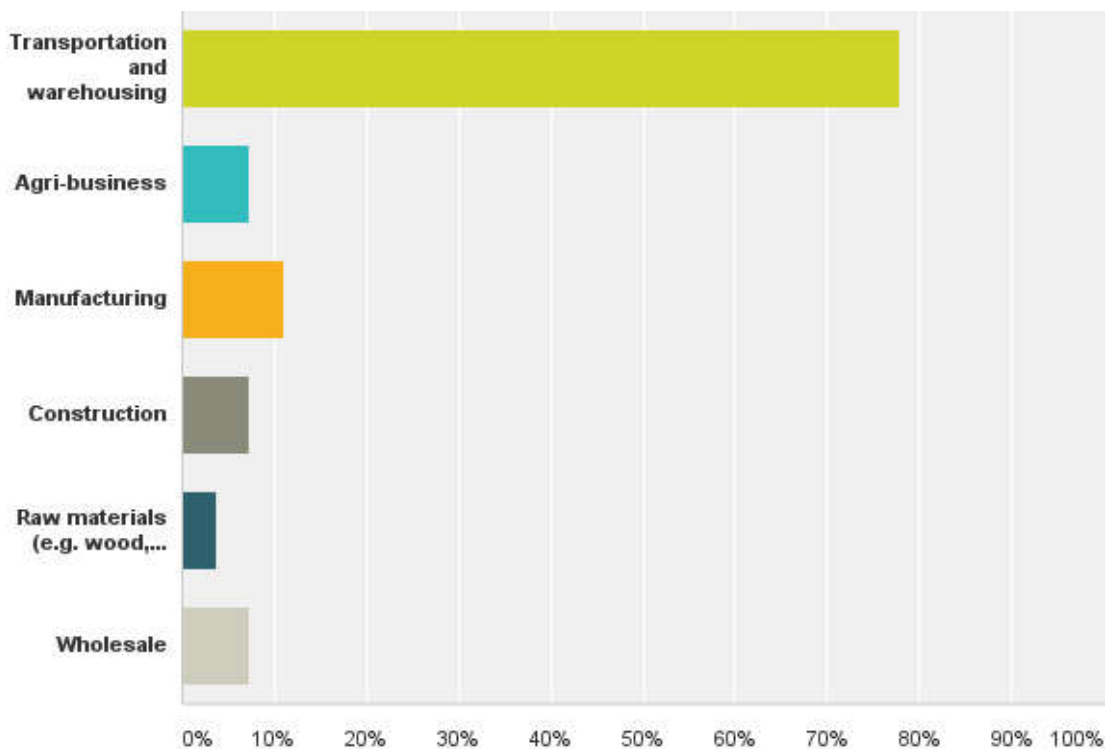
15. Stakeholder Survey
16. Outreach Events
17. Webinar Presentation
18. Draft Plan Comments

Stakeholder Interviews/Surveys

ATTACHMENT 1: Freight Industry Surveys and Responses: 33 total responses

Q2: Please describe your business sector(s). Choose all that are applicable.

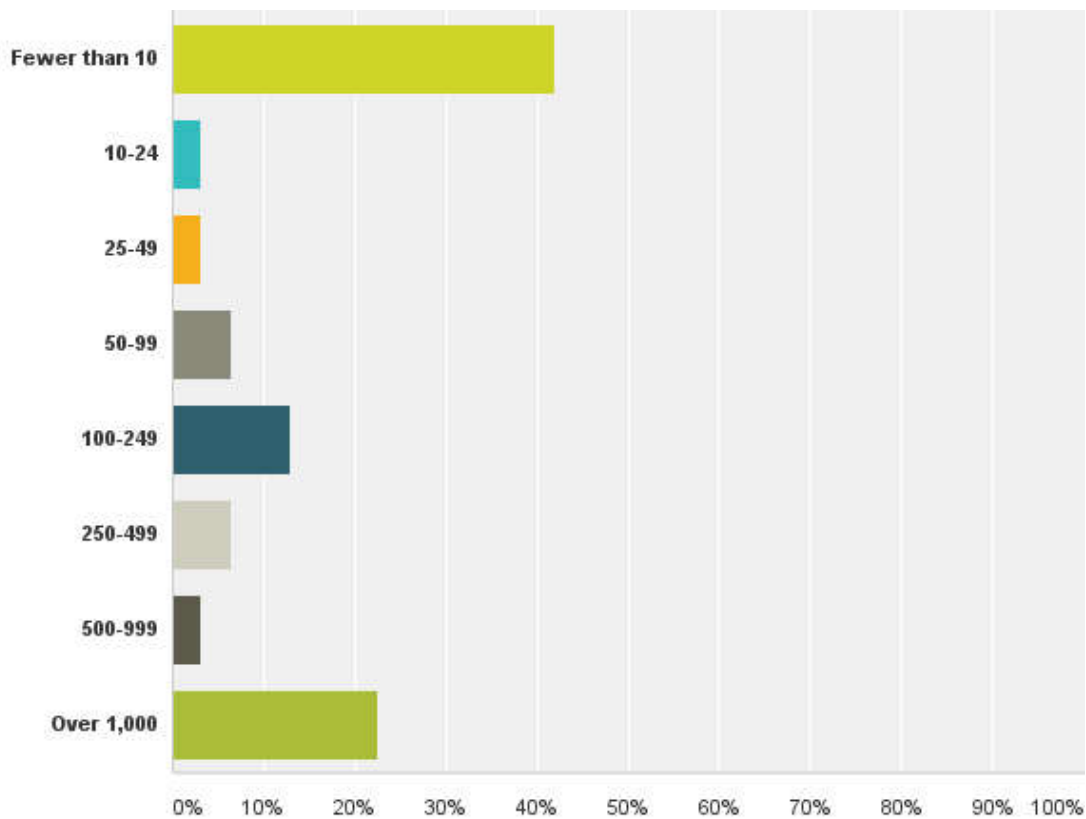
Answer Choices	Responses
Transportation and warehousing	77.78% 21
Agri-business	7.41% 2
Manufacturing	11.11% 3
Construction	7.41% 2
Raw materials (e.g. wood, stone, oil)	3.70% 1
Wholesale	7.41% 2
Total Respondents: 27	



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Q5: How many employees do you have in Missouri?

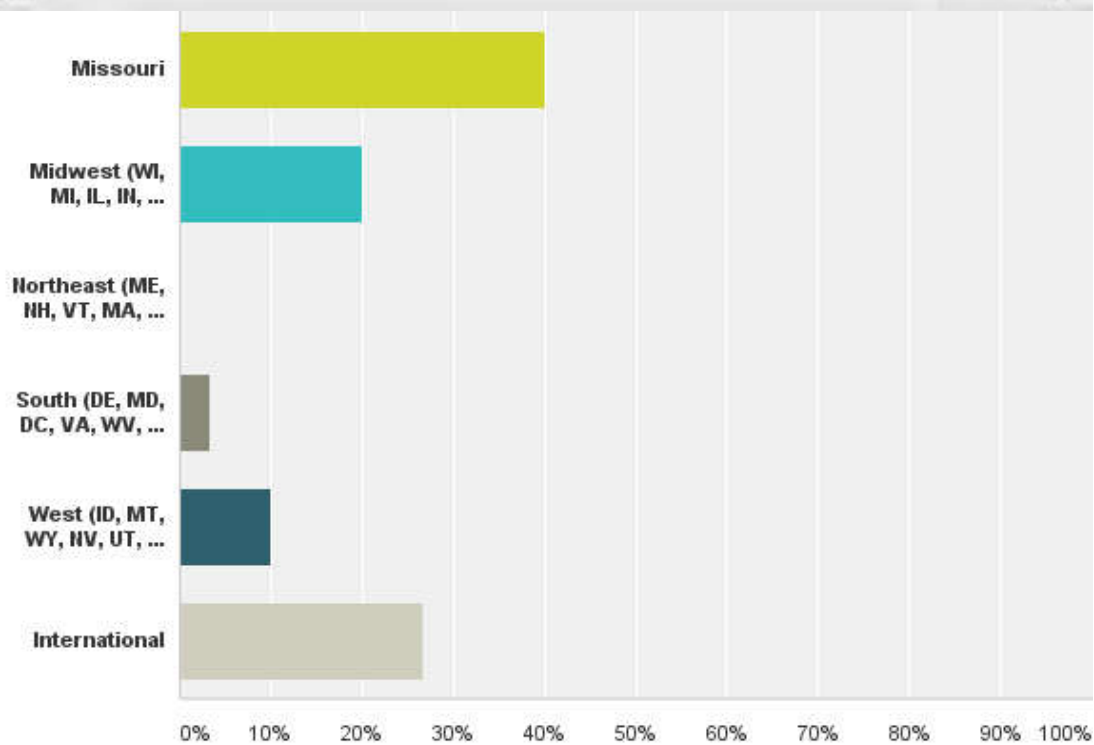
Answer Choices	Responses	
Fewer than 10	41.94%	13
10-24	3.23%	1
25-49	3.23%	1
50-99	6.45%	2
100-249	12.90%	4
250-499	6.45%	2
500-999	3.23%	1
Over 1,000	22.58%	7
Total		31



Appendix D - Stakeholder Outreach

Q7: Where are your suppliers primarily located?

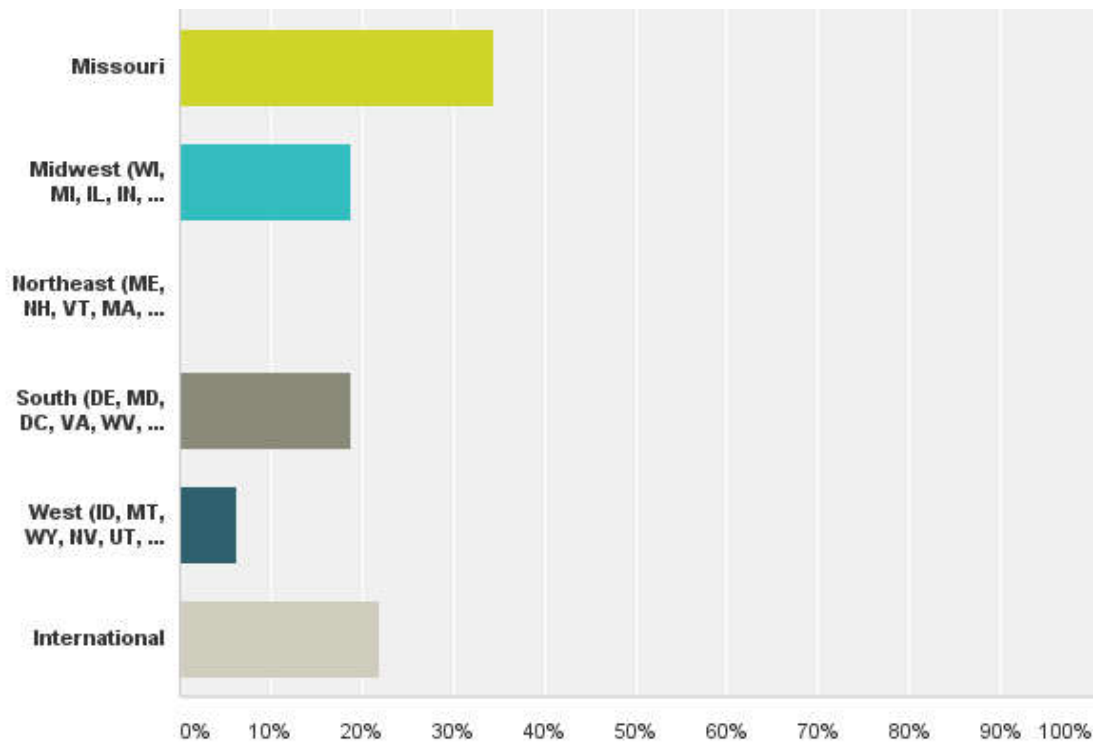
Answer Choices	Responses	
Missouri	40.00%	12
Midwest (WI, MI, IL, IN, OH, MO, ND, SD, NE, KS, MN, IA)	20.00%	6
Northeast (ME, NH, VT, MA, RI, CT, NY, PA, NJ)	0.00%	0
South (DE, MD, DC, VA, WV, NC, SC, GA, FL, KY, TN, MS, AL, OK, TX, AR, LA)	3.33%	1
West (ID, MT, WY, NV, UT, CO, AZ, NM, AK, WA, OR, CA, HI)	10.00%	3
International	26.67%	8
Total		30



Appendix D - Stakeholder Outreach

Q8: Where are your customers primarily located?

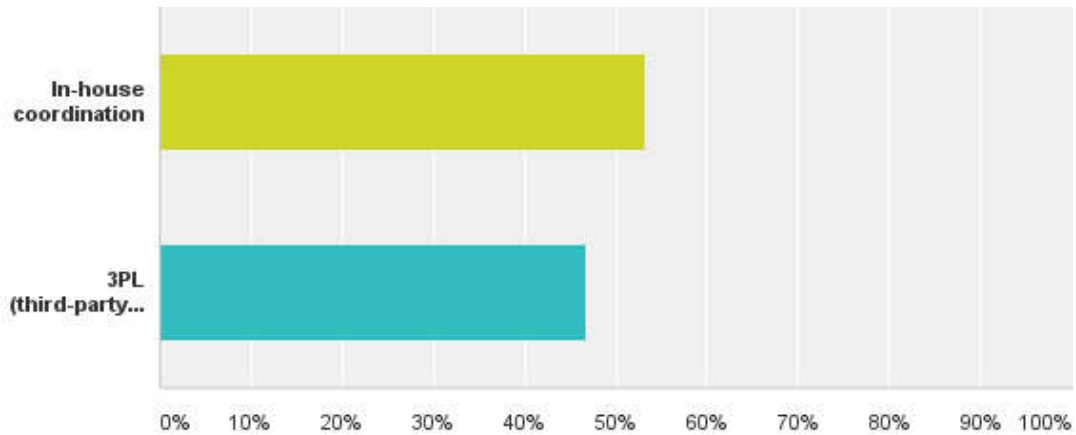
Answer Choices	Responses	
Missouri	34.38%	11
Midwest (WI, MI, IL, IN, OH, MO, ND, SD, NE, KS, MN, IA)	18.75%	6
Northeast (ME, NH, VT, MA, RI, CT, NY, PA, NJ)	0.00%	0
South (DE, MD, DC, VA, WV, NC, SC, GA, FL, KY, TN, MS, AL, OK, TX, AR, LA)	18.75%	6
West (ID, MT, WY, NV, UT, CO, AZ, NM, AK, WA, OR, CA, HI)	6.25%	2
International	21.88%	7
Total		32



Appendix D - Stakeholder Outreach

Q9: Please describe your overall logistics operations.

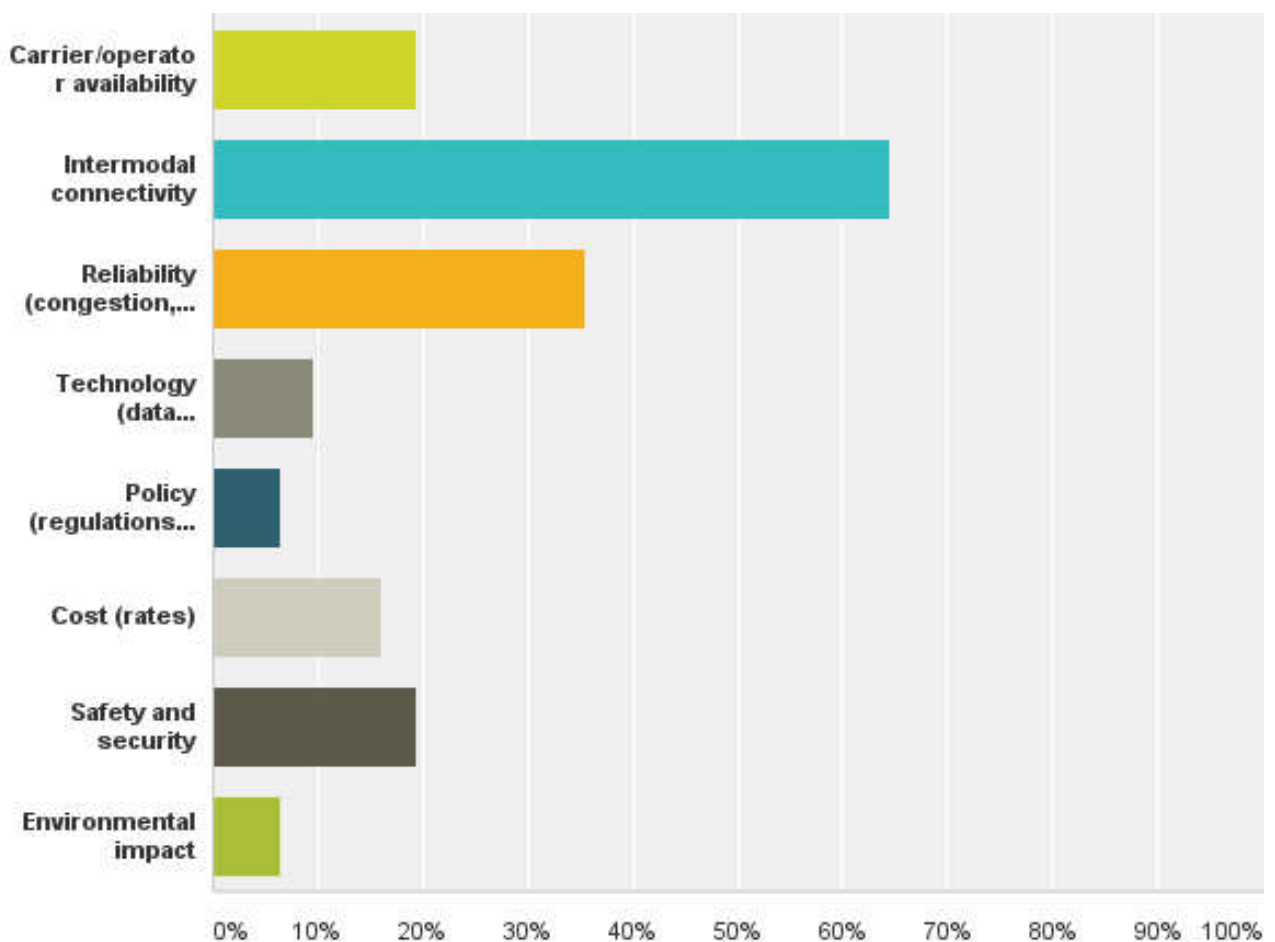
Answer Choices	Responses
In-house coordination	53.33% 16
3PL (third-party logistics provider)	46.67% 14
Total	30



Appendix D - Stakeholder Outreach

Q10: What are the greatest strengths of Missouri's freight system? Please select up to THREE options.

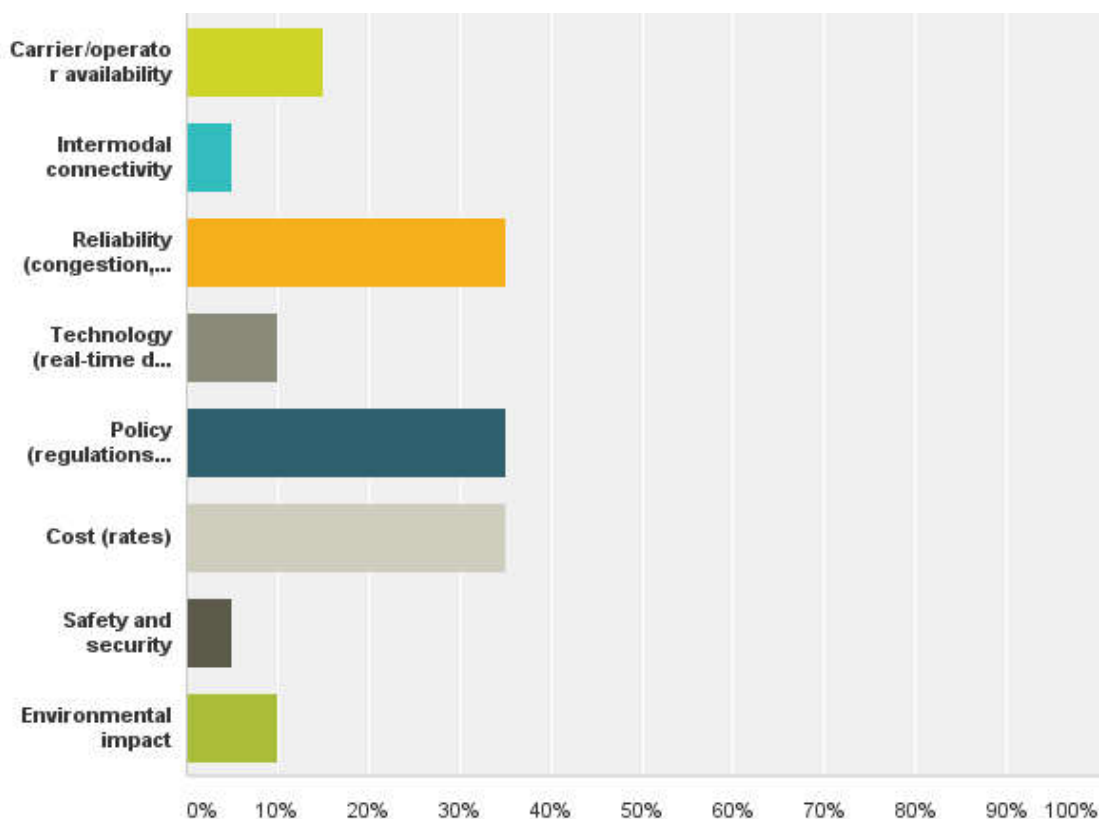
Answer Choices	Responses	
Carrier/operator availability	19.35%	6
Intermodal connectivity	64.52%	20
Reliability (congestion, travel time, facility conditions)	35.48%	11
Technology (data collection and analysis, communications)	9.68%	3
Policy (regulations, incentives)	6.45%	2
Cost (rates)	16.13%	5
Safety and security	19.35%	6
Environmental impact	6.45%	2
Total Respondents: 31		



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Q11: What are the biggest challenges for Missouri freight in the next 5 to 10 years? Please select up to THREE options.

Answer Choices	Responses	
Carrier/operator availability	15.00%	3
Intermodal connectivity	5.00%	1
Reliability (congestion, travel time, facility conditions)	35.00%	7
Technology (real-time data collection and analysis, communications)	10.00%	2
Policy (regulations, incentives)	35.00%	7
Cost (rates)	35.00%	7
Safety and security	5.00%	1
Environmental impact	10.00%	2
Total Respondents: 20		



Appendix D - Stakeholder Outreach

Q13: How important is freight to the Missouri economy?

	Not very important	Somewhat important	Very important	No opinion	Total	Average Rating
(no label)	0.00% 0	0.00% 0	100.00% 32	0.00% 0	32	3.00

Q14: May we contact you about future opportunities to participate in the Missouri State Freight Plan?

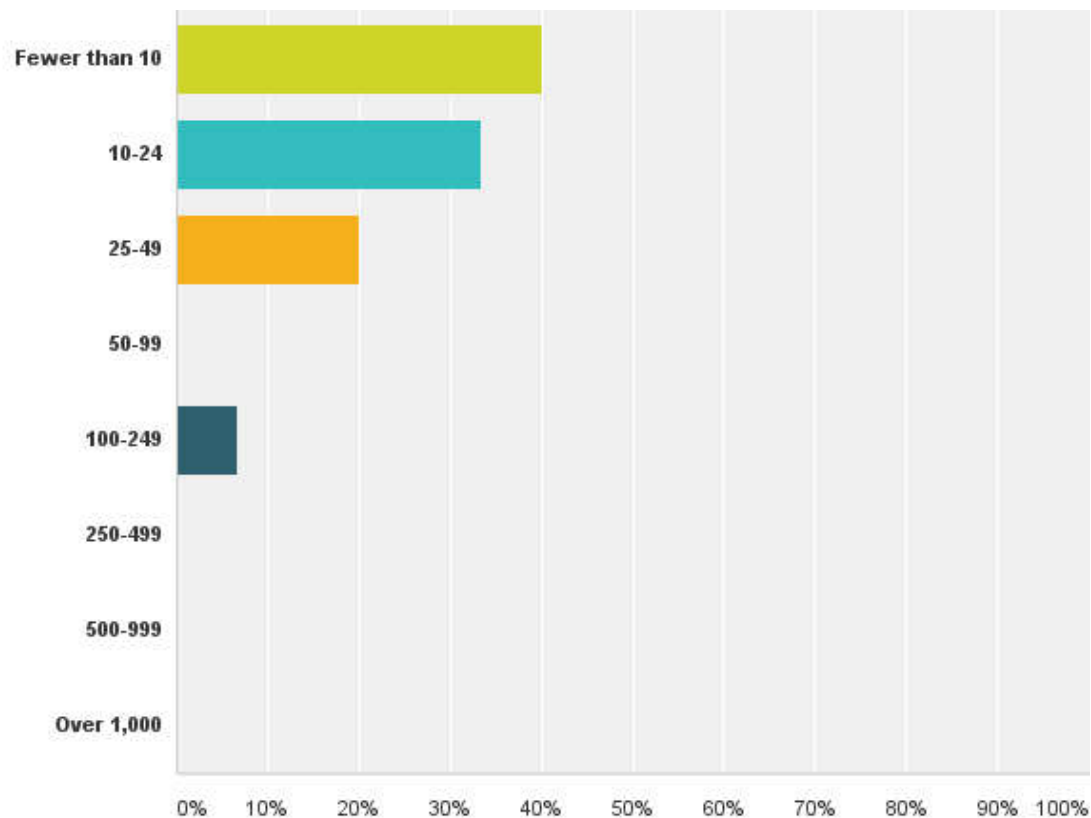
Answer Choices	Responses
Yes	70.00% 21
No	30.00% 9
Total	30

Appendix D - Stakeholder Outreach

ATTACHMENT 2: Community Leaders Interview/Survey: 26 responses

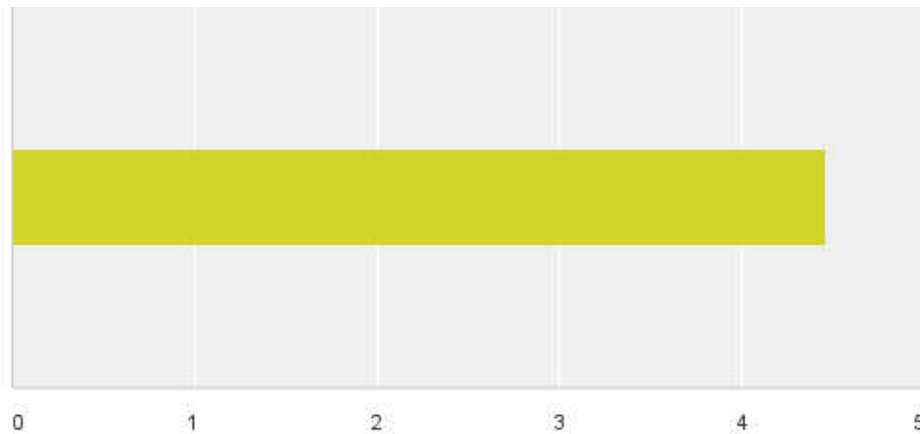
Q3: How many employees do you have in Missouri?

Answer Choices	Responses	
Fewer than 10	40.00%	6
10-24	33.33%	5
25-49	20.00%	3
50-99	0.00%	0
100-249	6.67%	1
250-499	0.00%	0
500-999	0.00%	0
Over 1,000	0.00%	0
Total		15



Appendix D - Stakeholder Outreach

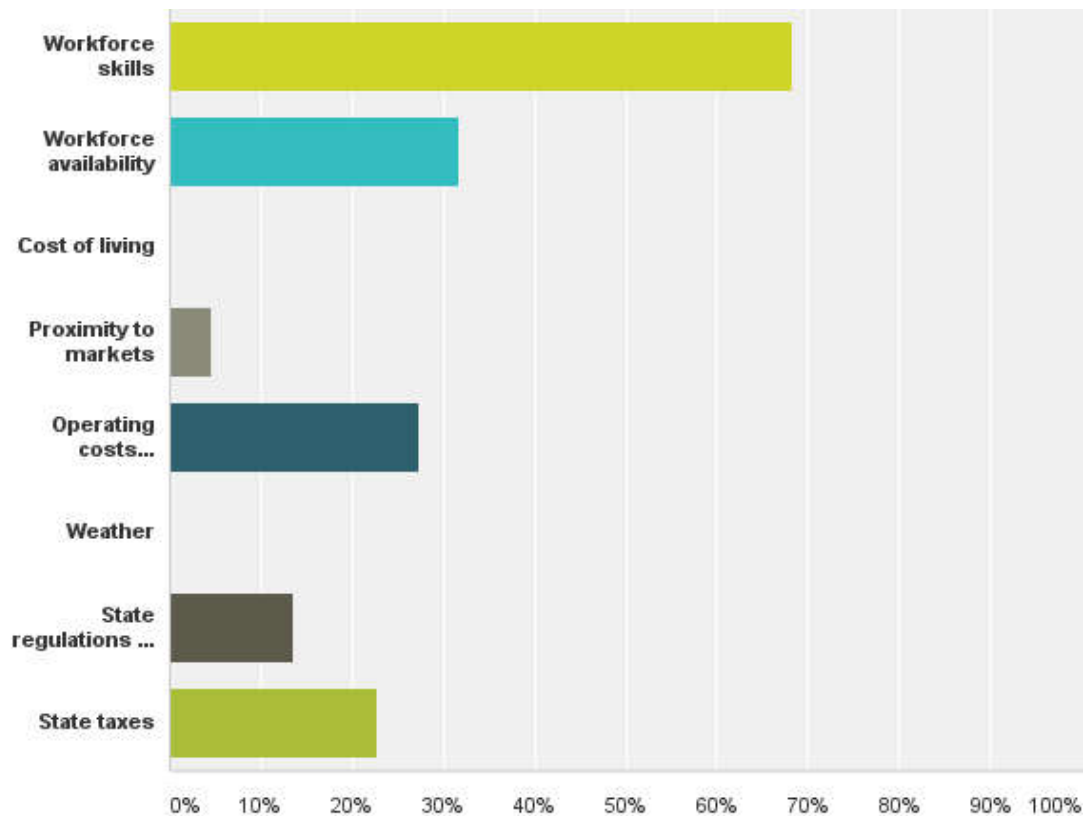
Q4: On a scale of 1 to 5, with 5 being the most important, please rate the importance of freight transportation in convincing businesses to come to or grow in Missouri.



1	2	3	4	5	No opinion	Total	Average Rating
0.00%	0.00%	0.00%	54.17%	45.83%	0.00%	24	4.46
0	0	0	13	11	0		

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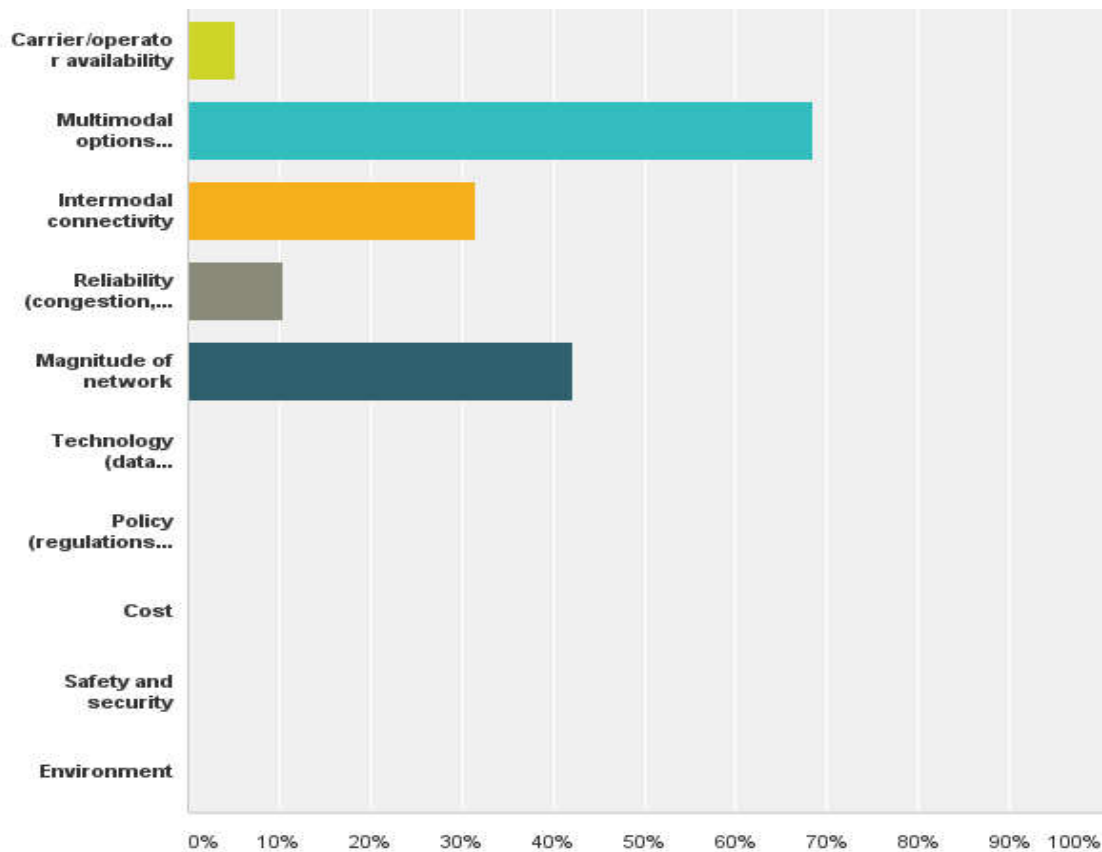
Q5: What factors are as important as or more important than freight transportation in convincing business to come to or grow in Missouri? Please choose all that apply



Answer Choices	Responses
Workforce skills	68.18% 15
Workforce availability	31.82% 7
Cost of living	0.00% 0
Proximity to markets	4.55% 1
Operating costs (utilities, land, etc.)	27.27% 6
Weather	0.00% 0
State regulations and policies	13.64% 3
State taxes	22.73% 5
Total Respondents: 22	

Appendix D - Stakeholder Outreach

Q6: What are the greatest strengths of Missouri's freight system? Please select up to THREE options.

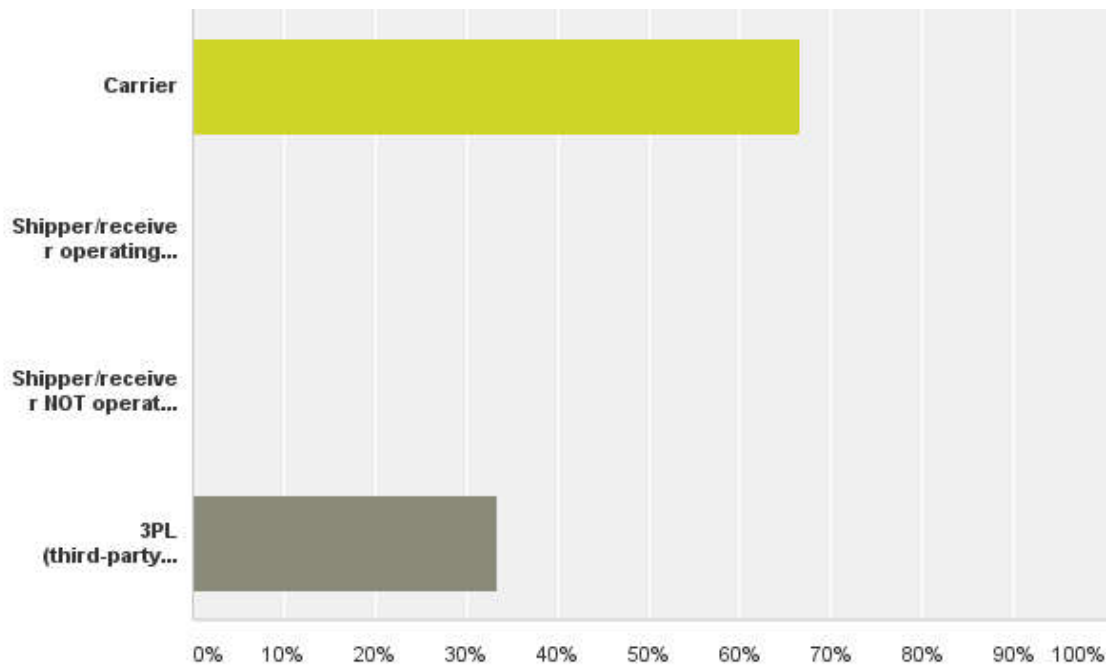


Answer Choices	Responses	
Carrier/operator availability	5.26%	1
Multimodal options (freight diversity)	68.42%	13
Intermodal connectivity	31.58%	6
Reliability (congestion, travel time, facility conditions)	10.53%	2
Magnitude of network	42.11%	8
Technology (data collection and analysis, communications)	0.00%	0
Policy (regulations, incentives)	0.00%	0
Cost	0.00%	0
Safety and security	0.00%	0
Environment	0.00%	0
Total Respondents: 19		

Appendix D - Stakeholder Outreach

ATTACHMENT 3: Motor Carriers, Shippers and Receivers Interviews/Surveys: 3 responses

Q1: Please describe your overall business model.



Answer Choices	Responses
Carrier	66.67% 2
Shipper/receiver operating private fleet	0.00% 0
Shipper/receiver NOT operating private fleet	0.00% 0
3PL (third-party logistics provider)	33.33% 1
Total	3

Appendix D - Stakeholder Outreach

Q2: Please describe the business sector(s) you serve. Choose all that are applicable.

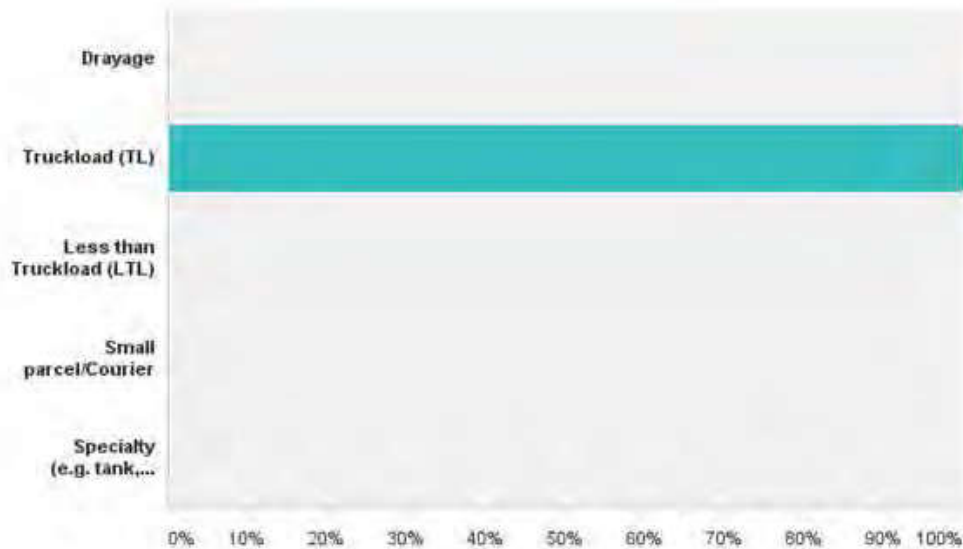
Answer Choices	Responses
Transportation and warehousing	0.00% 0
Agri-business	0.00% 0
Manufacturing	0.00% 0
Construction	0.00% 0
Raw materials (e.g. wood, stone, oil)	0.00% 0
Wholesale	0.00% 0
Total Respondents: 0	

Q5: How many employees do you have in Missouri?

Answer Choices	Responses
Fewer than 10	0.00% 0
10-24	0.00% 0
25-49	0.00% 0
50-99	0.00% 0
100-249	0.00% 0
250-499	0.00% 0
500-999	0.00% 0
Over 1,000	0.00% 0
Total	0

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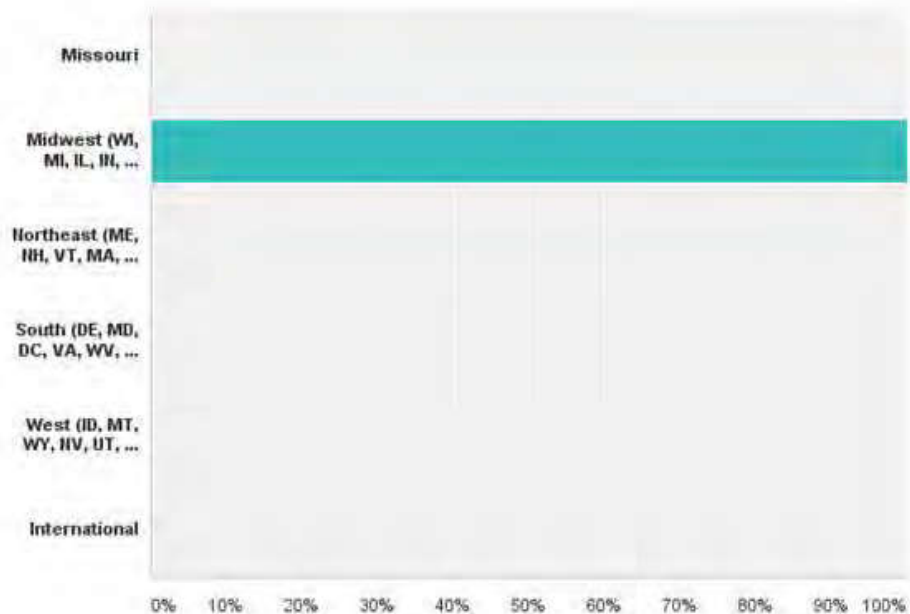
Q7: MOTOR CARRIERS: Which industry segment best represents your operations?



Answer Choices	Responses	
Drayage	0.00%	0
Truckload (TL)	100.00%	1
Less than Truckload (LTL)	0.00%	0
Small parcel/Courier	0.00%	0
Specialty (e.g. tank, heavy haul, refrigerated)	0.00%	0
Total		1

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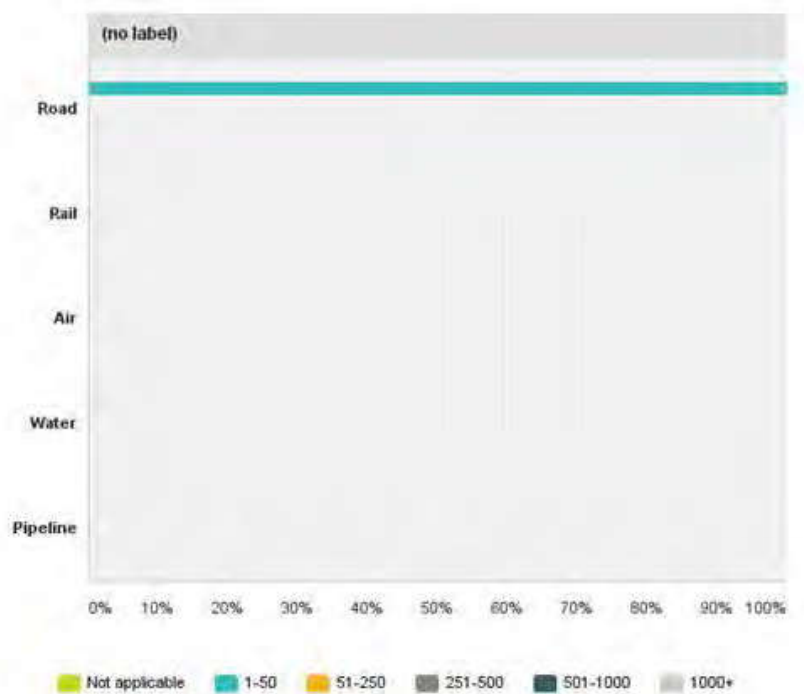
Q8: ALL: What region best describes your operational coverage?



Answer Choices	Responses
Missouri	0.00% 0
Midwest (WI, MI, IL, IN, OH, MO, ND, SD, NE, KS, MN, IA)	100.00% 1
Northeast (ME, NH, VT, MA, RI, CT, NY, PA, NJ)	0.00% 0
South (DE, MD, DC, VA, WV, NC, SC, GA, FL, KY, TN, MS, AL, OK, TX, AR, LA)	0.00% 0
West (ID, MT, WY, NV, UT, CO, AZ, NM, AK, WA, OR, CA, HI)	0.00% 0
International	0.00% 0
Total	1

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Q9: ALL: What is the total number of power units in your fleet, by mode? (i.e. tractors, engines, ships, planes)



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Q10: ALL: What percent of your fleet operates in Missouri?

Answer Choices	Responses
1-25%	0.00% 0
26-50%	100.00% 1
51-75%	0.00% 0
76-99%	0.00% 0
100%	0.00% 0
Total	1

Q11: ALL: What freight corridors to you operate on?

Answer Choices	Responses
Road: Interstates	100.00% 1
Road: State highways	100.00% 1
Road: Local roads	100.00% 1
Water: Missouri River	0.00% 0
Water: Mississippi River	0.00% 0
Rail: Class I	0.00% 0
Rail: Shortline	0.00% 0
Air	0.00% 0
Pipeline	0.00% 0
Total Respondents: 1	

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Q12: AIR CARRIERS: What is your annual air cargo tonnage?

Answer Choices	Average Number	Total Number	Responses
Annual air cargo tonnage:	0	0	0
Total Respondents: 0			

Q13: ALL: What percent of your shipments are domestic versus international? Please leave off the percent symbol when entering answers (i.e. use "50" for 50%).

Answer Choices	Average Number	Total Number	Responses
Domestic:	90	90	1
International:	0	0	0
Total Respondents: 1			

Q14: How many facilities do you operate in Missouri?

Answer Choices	Average Number	Total Number	Responses
Facilities in MO:	0	0	0
Total Respondents: 0			

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Q15: CURRENTLY, how do you utilize each mode of freight transportation?

	0%	1-25%	26-50%	51-75%	76-99%	100%	Total
Road	0.00% 0	0.00% 0	0.00% 0	0.00% 0	0.00% 0	0.00% 0	0
Rail	0.00% 0	0.00% 0	0.00% 0	0.00% 0	0.00% 0	0.00% 0	0
Air	0.00% 0	0.00% 0	0.00% 0	0.00% 0	0.00% 0	0.00% 0	0
Water	0.00% 0	0.00% 0	0.00% 0	0.00% 0	0.00% 0	0.00% 0	0
Pipeline	0.00% 0	0.00% 0	0.00% 0	0.00% 0	0.00% 0	100.00% 1	1

Q16: In the NEXT 3 TO 5 YEARS, how do you plan to utilize each mode of freight transportation?

	0%	1-25%	26-50%	51-75%	76-99%	100%	Total
Road	0.00% 0	0.00% 0	0.00% 0	0.00% 0	0.00% 0	0.00% 0	0
Rail	0.00% 0	0.00% 0	0.00% 0	0.00% 0	0.00% 0	0.00% 0	0
Air	0.00% 0	0.00% 0	0.00% 0	0.00% 0	0.00% 0	0.00% 0	0
Water	0.00% 0	0.00% 0	0.00% 0	0.00% 0	0.00% 0	0.00% 0	0
Pipeline	0.00% 0	0.00% 0	0.00% 0	0.00% 0	0.00% 0	100.00% 1	1

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Q17: Please rate your overall satisfaction or dissatisfaction with Missouri's freight network by mode.

	Very dissatisfied	Dissatisfied	Satisfied	Very satisfied	Not applicable	Total	Average Rating
Road	0.00% 0	0.00% 0	100.00% 1	0.00% 0	0.00% 0	1	3.00
Rail	0.00% 0	0.00% 0	100.00% 1	0.00% 0	0.00% 0	1	3.00
Air	0.00% 0	0.00% 0	0.00% 0	0.00% 0	100.00% 1	1	0.00
Water	0.00% 0	0.00% 0	0.00% 0	0.00% 0	100.00% 1	1	0.00
Pipeline	0.00% 0	0.00% 0	0.00% 0	50.00% 1	50.00% 1	2	4.00

Q18: What are the greatest strengths of Missouri's freight system? Please select up to THREE options.

Answer Choices	Responses
Carrier/operator availability	0.00% 0
Multimodal options (freight diversity)	50.00% 1
Intermodal connectivity	0.00% 0
Reliability (congestion, travel time, facility conditions)	50.00% 1
Magnitude of freight network	50.00% 1
Technology (data collection and analysis, communications)	0.00% 0
Policy (regulations, incentives)	50.00% 1
Cost (rates)	0.00% 0
Safety and security	0.00% 0
Environmental impact	0.00% 0
Total Respondents: 2	

Appendix D - Stakeholder Outreach

Q19: What are the biggest challenges for Missouri freight in the next 5 to 10 years? Please select up to THREE options.

Answer Choices	Responses	
Carrier/operator availability	0.00%	0
Multimodal options (freight diversity)	0.00%	0
Intermodal connectivity	0.00%	0
Reliability (congestion, travel time, facility conditions)	0.00%	0
Magnitude of freight network	0.00%	0
Technology (data collection and analysis, communications)	0.00%	0
Policy (regulations, incentives)	50.00%	1
Cost (rates)	50.00%	1
Safety and security	0.00%	0
Environmental impact	100.00%	2
Total Respondents: 2		

Q21: How important is freight to the Missouri economy?

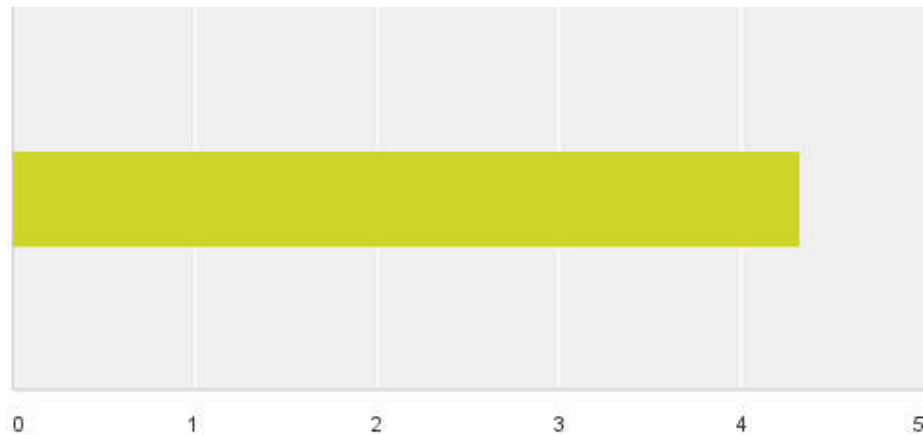
	Not very important	Somewhat important	Very important	No opinion	Total	Average Rating
(no label)	0.00% 0	50.00% 1	50.00% 1	0.00% 0	2	2.50

Appendix D - Stakeholder Outreach

ATTACHMENT 4: MoFreightPlan.com Surveys: 101 total responses

Q2: On a scale of 1 to 5, with 5 being the most important, please rate the importance of freight transportation in attracting business to Missouri.

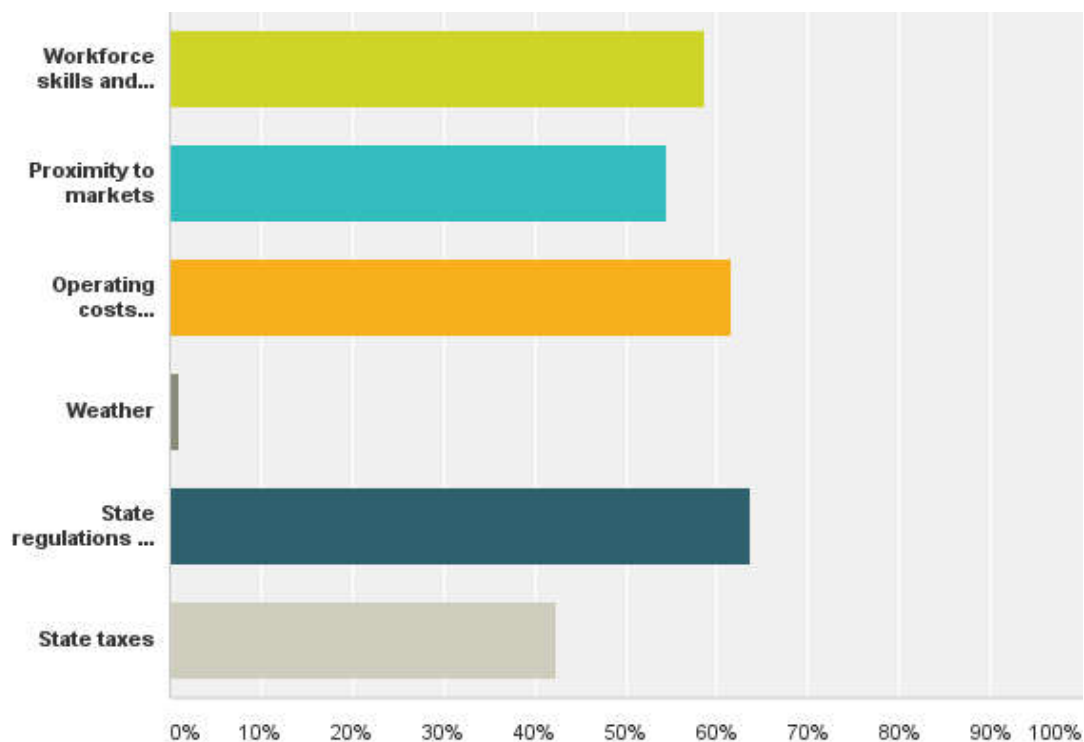
1	2	3	4	5	No opinion	Total	Average Rating
2.15%	3.23%	2.15%	44.09%	46.24%	2.15%	93	4.32
2	3	2	41	43	2		



Appendix D - Stakeholder Outreach

Q3: What other factors are important to attracting business to Missouri? Select up to three options.

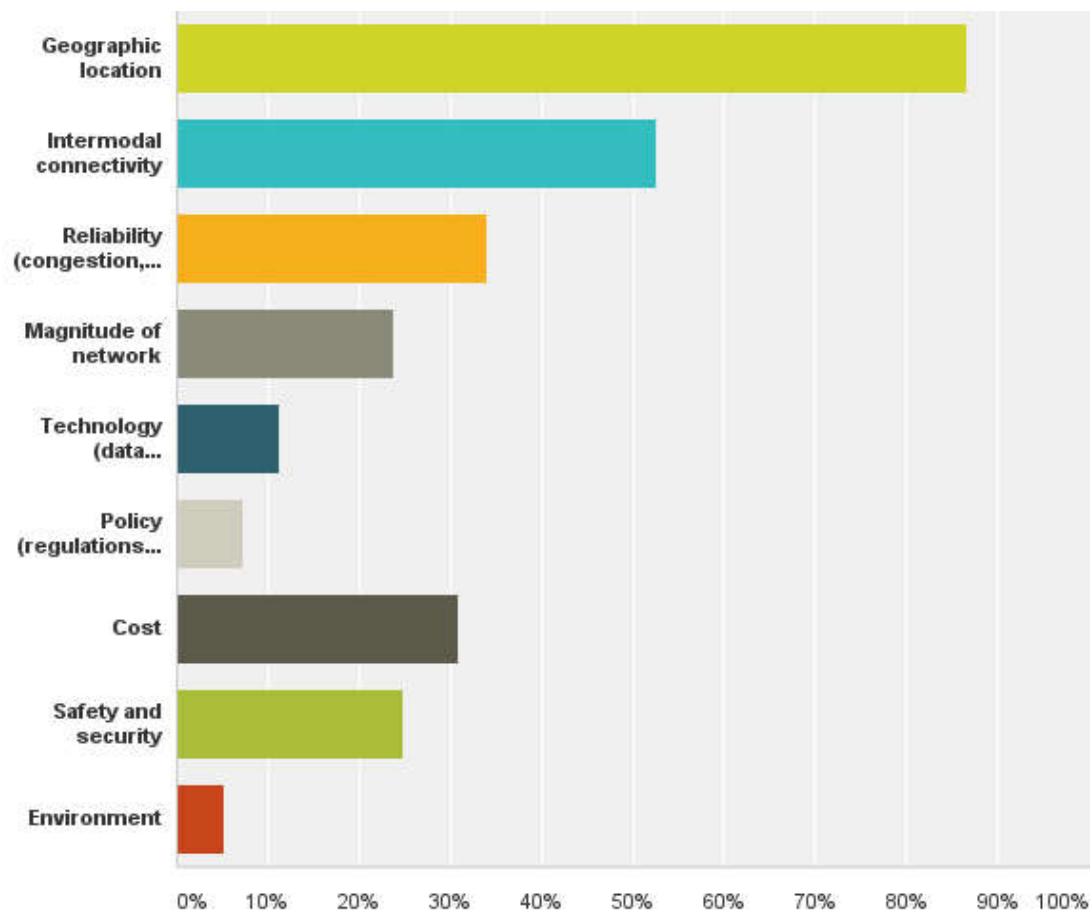
Answer Choices	Responses
Workforce skills and availability	58.59% 58
Proximity to markets	54.55% 54
Operating costs (utilities, land, etc.)	61.62% 61
Weather	1.01% 1
State regulations and policies	63.64% 63
State taxes	42.42% 42
Total Respondents: 99	



Appendix D - Stakeholder Outreach

Q4: What are the greatest strengths of Missouri's freight system? Select all that apply.

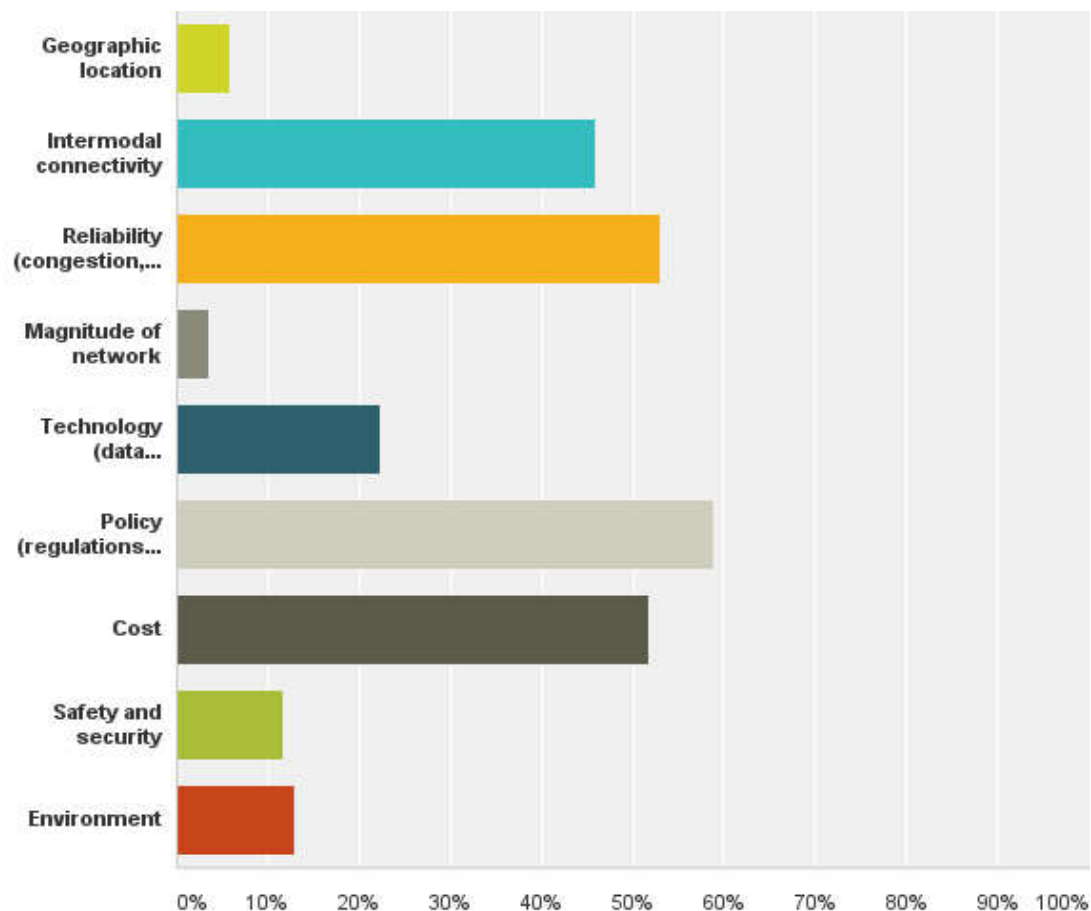
Answer Choices	Responses
Geographic location	86.60% 84
Intermodal connectivity	52.58% 51
Reliability (congestion, travel time, facility conditions)	34.02% 33
Magnitude of network	23.71% 23
Technology (data collection and analysis, communications)	11.34% 11
Policy (regulations, incentives)	7.22% 7
Cost	30.93% 30
Safety and security	24.74% 24
Environment	5.15% 5
Total Respondents: 97	



Appendix D - Stakeholder Outreach

Q5: What are the biggest challenges for Missouri freight in the next 5 to 10 years? Select all that apply.

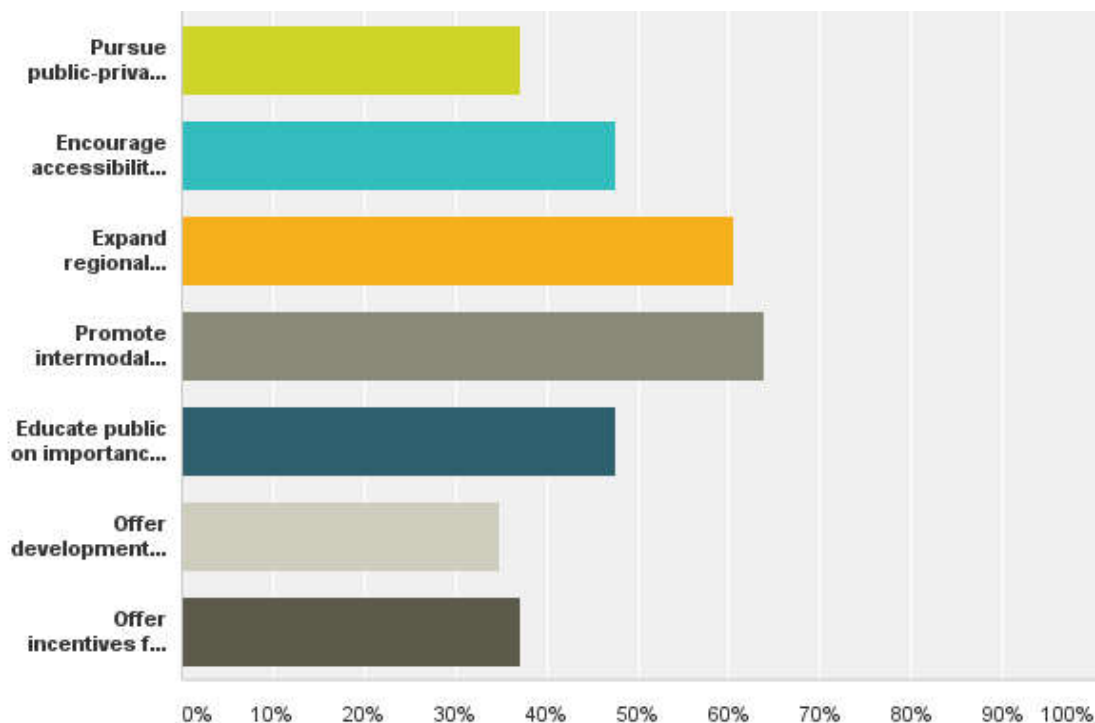
Answer Choices	Responses
Geographic location	5.88% 5
Intermodal connectivity	45.88% 39
Reliability (congestion, travel time, facility conditions)	52.94% 45
Magnitude of network	3.53% 3
Technology (data collection and analysis, communications)	22.35% 19
Policy (regulations, incentives)	58.82% 50
Cost	51.76% 44
Safety and security	11.76% 10
Environment	12.94% 11
Total Respondents: 85	



Appendix D - Stakeholder Outreach

Q6: What strategies would you like to see utilized to promote freight transportation in Missouri? Select all that apply.

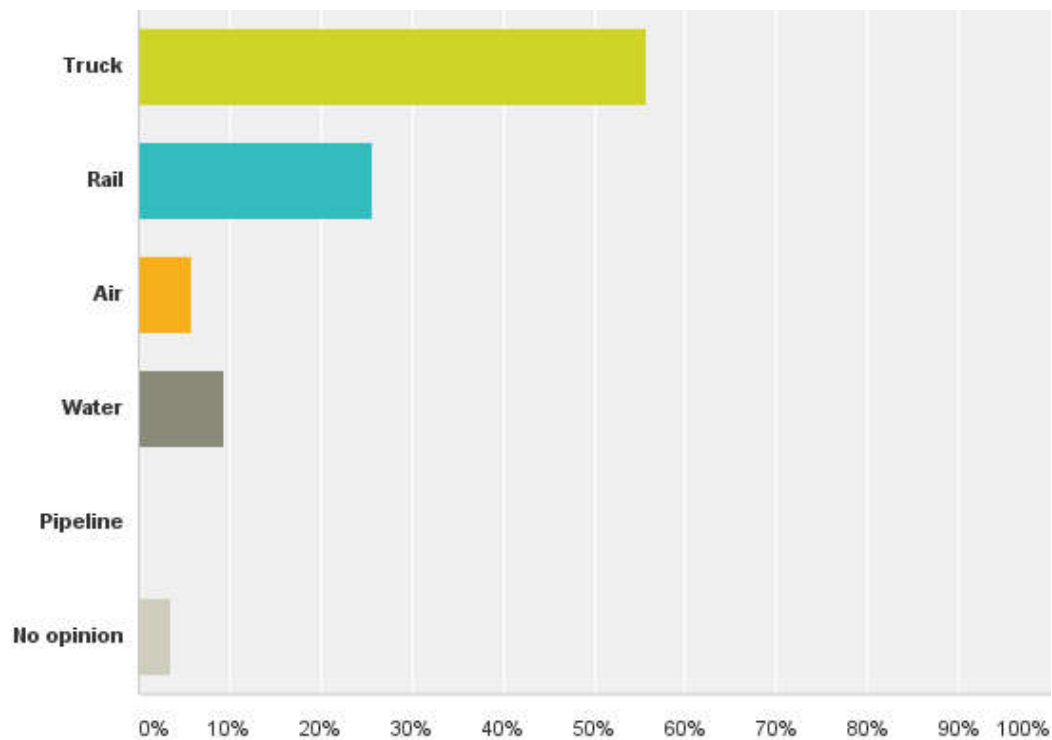
Answer Choices	Responses
Pursue public-private partnerships (P3s)	37.21% 32
Encourage accessibility in planning process	47.67% 41
Expand regional capacity	60.47% 52
Promote intermodal connectivity	63.95% 55
Educate public on importance of MO freight	47.67% 41
Offer development incentives to freight users	34.88% 30
Offer incentives for enhancements to freight network, efficiency and safety	37.21% 32
Total Respondents: 86	



Appendix D - Stakeholder Outreach

Q7: In the NEXT 5 YEARS, which freight mode do you expect will see the most growth in Missouri?

Answer Choices	Responses	
Truck	55.81%	48
Rail	25.58%	22
Air	5.81%	5
Water	9.30%	8
Pipeline	0.00%	0
No opinion	3.49%	3
Total		86



Appendix D - Stakeholder Outreach

Q9: May we contact you about future opportunities to participate in the Missouri Statewide Freight Plan?

Answer Choices	Responses	
Yes	72.73%	8
No	27.27%	3
Total		11

Freight Forum Presentation

ATTACHMENT 5: Statewide Presentation



Statewide Freight Forum
MoDOT Statewide Freight Plan

MoFreightPlan.org

2012 Missouri freight exports

\$13.9B



A Vision for Missouri's Transportation Future



Invest in projects that
spur economic growth
and create jobs

MissouriOnTheMove.org



On the Move goals

1. Take care of the transportation system
2. Keep all travelers safe, no matter the mode of transportation
3. Invest in projects that spur economic growth and create jobs
4. Give Missourians better transportation choices





Why a Freight Plan?

Building on *On the Move* and through **collaboration with freight partners**, we will **identify opportunities and actions** in the Freight Plan to **increase economic development and jobs**.



Focus Resources

- Project prioritization
- Business development
- Stark reality



Why reach out?

cost\$



Why reach out?

**What if more funds
become available?**



Why reach out?

**Stakeholders know best
which projects and policies
can make businesses more
competitive**



What's in a Freight Plan?

- Existing data
- Inventory of freight strengths and weaknesses
- Freight goals and performance measures development
- Scenario planning
- Strategic policy improvements
- Project priorities

State Freight Plan



Why is freight important?

- Freight volumes continue to grow



Why is freight important?

- Exports – global market competitiveness

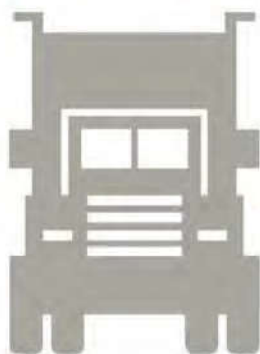


Why is freight important?

- Freight mobility is the economy in motion



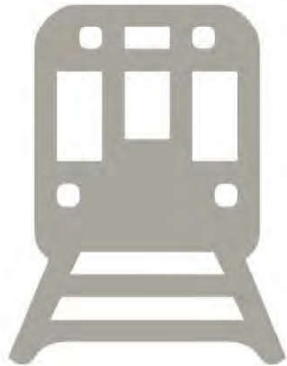
How does freight move in Missouri?



Crossroads of the nation



How does freight move in Missouri?



 **Top rail hubs
in nation**



How does freight move in Missouri?



 **Missouri and
Mississippi
Rivers**



How does freight move in Missouri?

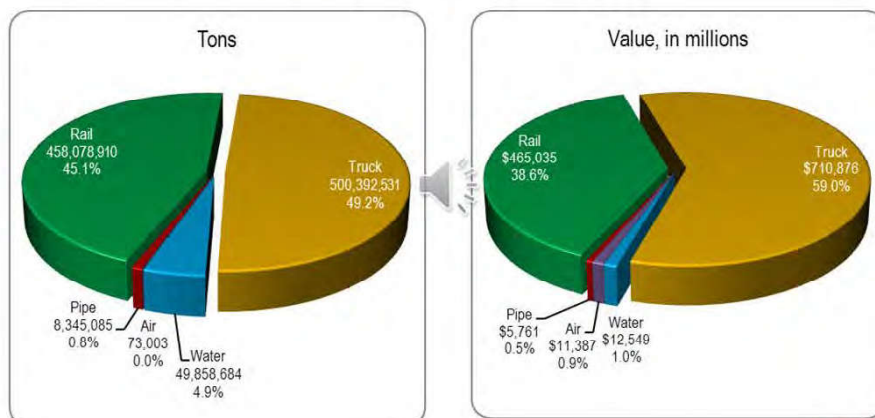


Two
international
airports in MO

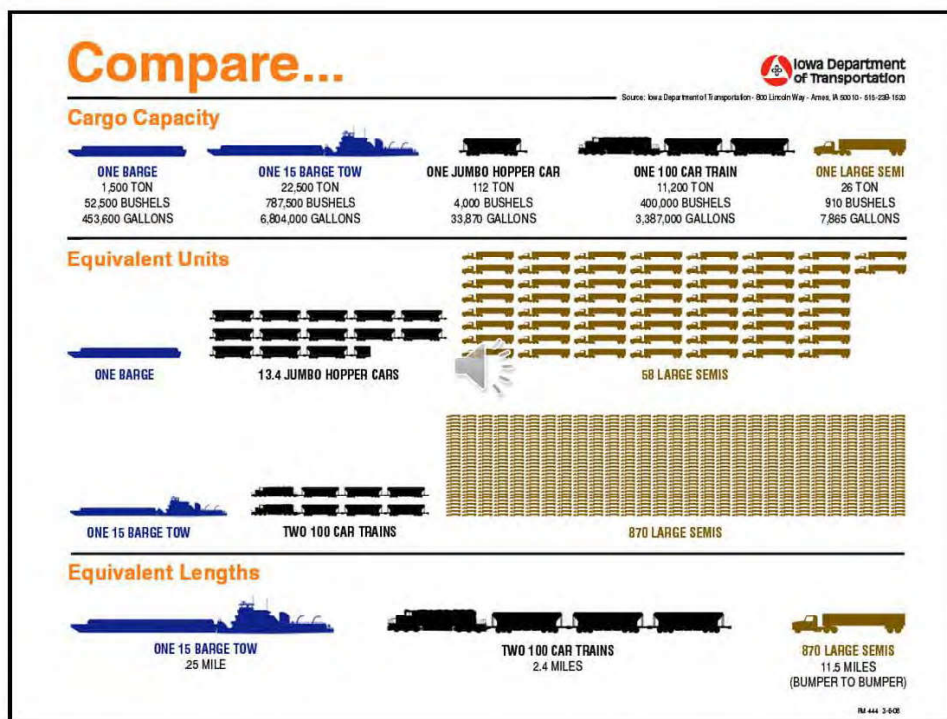


Freight Movement

Total Tons and Value by Mode, 2011



Appendix D - Stakeholder Outreach



What have we heard across the state?



Generally, well-connected road network, but...



Connect all freight modes



Utilize waterways



Engage all private stakeholders




Northwest District

- Farm to market routes
- Dwindling rail
- Road capacity upgrades
- Access to economic development centers
- Water levels






Appendix D - Stakeholder Outreach





Northeast District

- Need highway improvements
- Railroad closings
- Mississippi River improvements




St. Louis District

- Freight hub status
- I-70/I-44 congestion
- Last mile connections





Appendix D - Stakeholder Outreach




Southeast District

- Limited east/west connectivity
- US-67 completion
- Secondary highway upgrades
- Port funding




Southwest District

- Interstate upgrades
- Motor carrier accommodation and recruitment
- Flexible funding






Appendix D - Stakeholder Outreach





Kansas City District

- I-70 upgrades
- Private sector engagement
- E-commerce

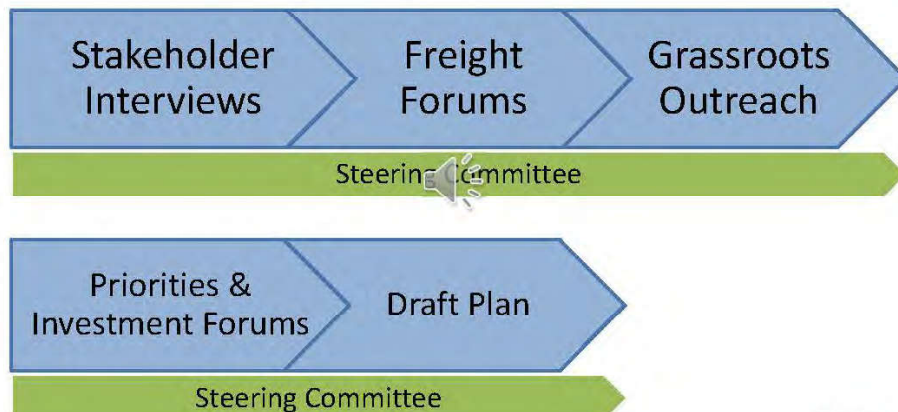


Central District

- Improve north-south connectivity
- Missouri River potential
- Innovative funding
- Ag industry support



Keeping you involved



Keeping you involved

- Priorities & Investment Forums
 - April 24 – Springfield
Hosted by the Springfield Chamber
 - April 25 – Kansas City
Hosted by the Kansas City Aviation Department
 - May 2 – St. Louis
Hosted by the St. Louis World Trade Center



Keeping you involved

Please complete survey at

MoFreightPlan.org



Thank You!

For more information, contact:

Cheryl Ball
MoDOT Freight Administrator
cheryl.ball@modot.mo.gov
573-526-5578

Keith Bucklew
CDM Smith Project Manager
bucklewkj@cdmsmith.com
317-829-9629





District Freight Forum Summaries

Appendix D - Stakeholder Outreach

ATTACHMENT 6: Central District Profile

A Vision for Freight in Missouri >>



As part of our On the Move initiative in 2013, MoDOT talked with thousands of Missourians in all 114 counties about our state's transportation future. We learned that Missourians want a transportation system that is well maintained, safe, grows our economy and leads to job creation, and provides Missourians with more interconnected travel options.

Freight moved by truck, train, barge and plane is an essential part of Missouri's economy and growth. Making smart investments in our freight transportation system can provide better options for Missouri businesses to get their products to market. An improved freight transportation system can also lower transportation costs and help create more jobs. Because freight is key to Missouri's vitality, MoDOT is developing a freight plan - with your help.

Freight Plan Goals >>

The plan will build on On the Move and alongside Missourians and our freight partners, we will identify opportunities and actions in the Freight Plan to increase economic development and jobs. The Freight Plan is a "deeper dive" into one of the critical areas identified through On the Move.

Trucks are expected to remain an important part of freight movement in Missouri, but more and more shipments are anticipated to use multiple modes of transportation. By connecting different modes of transportation, we can deliver products faster and more cost-effectively. And that's good for Missouri businesses and consumers alike.

The Freight Plan will help MoDOT meet the current and future needs of Missouri businesses. In November 2013, we began working on the plan. Our goal is to have a final Freight Plan ready by September 2014.







The Central District and Freight >>

MoDOT's Central District has 18 counties covering more than 11,000 square miles. Residents of Missouri's central region enjoy an excellent quality of life with the cost of living far below the national average, and good access to excellent hospitals, educational institutions and outdoor recreation. Columbia and Jefferson City are the largest cities in the district. Top area industries are financial, life sciences, agribusiness, warehousing/distribution and manufacturing. Major employers include ABB Power, Brewer Science, State Farm Insurance and Tracker Marine.

Freight moves by multiple transportation modes in the Central District. Major area roads include I-44 and I-70, as well as US-63, US-54, US-50, and US-40. Regional airports are located in Columbia and Fort Leonard Wood (Waynesville). Major rail access is provided by Kansas City Southern, Norfolk Southern, Burlington Northern Santa Fe and Union Pacific. The region also has a Missouri River port facility in Boonville.



What have we heard locally? >>

-  Innovative funding options should continue to be explored. Stakeholders in this district are concerned that funding gaps are threatening programs that are working well, such as MoDOT's cost share program.
-  Efforts should be made to improve connectivity throughout the district. Stakeholders identified a need for improving north-south connections and specifically noted concerns with US-63 between Jefferson City and Rolla. The district could also benefit from improvements to I-70, such as increased lanes, as the interstate is critical to moving freight and supporting the agriculture industry. Several stakeholders suggested that a multi-modal hub between Columbia and Jefferson City would support economic development in the district.
-  The Missouri River is under-utilized and under-marketed. Stakeholders recognize that the district should expect increased demand over the next five years and beyond. Utilizing waterways will be critical in effectively moving additional freight and taking strain off of highways and rail lines.
-  The freight system needs to support the agriculture industry, which is key to the economic success of the district and the State. As one stakeholder noted, "2014 ag industry technology is being moved on a 1940's (freight) network."



What have we heard throughout the state? >>

MoDOT is strategically reaching out to key freight and industry stakeholders, such as logistics directors, shipping managers, and economic development professionals to discuss freight issues, needs, concerns, and opportunities in the state.

To date, MoDOT has received input from more than 180 key freight stakeholders through one-on-one interviews, district freight forums and surveys. Recurring themes from the state and each district are emerging and include:



Missouri generally has a well-connected and functioning road network until there is a hiccup, such as congestion, weather or construction. Stakeholders also identified a need for capacity and maintenance improvements to maintain reliability of interstates and minor routes.



Missouri is a “crossroads for the continent” and has a vast freight network that is an asset for retaining existing businesses and attracting new business. Stakeholders voiced concern that not all modes are readily accessible and well connected with other modes (e.g. rail to water ports) and that work needs to be done to integrate the freight modal networks.



There is a need to engage additional stakeholders to help guide the freight plan. Previous efforts have lacked private sector engagement. Over the last several years MoDOT has collaborated with several private sectors groups on successful projects. This is an opportunity to build on those relationships, share information and continue to collaborate.



Investigate possibilities for utilizing waterways. Stakeholders see potential for growth on the Missouri and Mississippi Rivers but consistently brought up concerns including frequency of dredging, lack of improvements to the lock and dam system and inconsistent water levels. The expansion of the Panama Canal was also mentioned by stakeholders who want to make sure the state is positioned to take advantage of potentially increased freight flow and remain competitive. Stakeholders are concerned about low water levels and the impacts to operations if dredging frequency decreases.



Appropriately funding freight transportation projects is a key stakeholder concern. Stakeholders voiced a need to preserve the existing freight network and systems, but also said that improvements and enhancements are key to growing the state's economy.

CENTRAL DISTRICT



Appendix D - Stakeholder Outreach

**Every \$1
invested in
transportation
generates \$4
in economic
activity.**

**"If we don't maintain
access to our economic
development hubs, we lose
out on long-term growth."**

Central District
2013 On the Move Listening Session Participant

Recent developments in Central Missouri increase reliance on freight networks

**AUG
2013**

Danuser Machine Company, Fulton to add 32,000 square feet of manufacturing space.

**MAY
2013**

Meramec Electrical Products announced plans to expand its manufacturing operations in Cuba, adding 47 new full-time jobs.

Marine Electrical Products, a switch panels and electrical components manufacturer, announced an expansion of their facility in Lebanon, expected to create 15 new jobs.

**MAR
2013**

3M announced plans to expand its specialty solar panel film production line at its Columbia plant over the next year, adding 50 jobs.

**FEB
2013**

Fluid Power Support, a steel fabrication company, will expand its operations in Mexico, making a capital investment of more than \$1.6 million and creating 15 new jobs.

**JAN
2013**

Brewer Science Inc., a company that produces materials for smartphones and tablet computers, plans to build a new manufacturing facility in rural central Missouri. The company expects to add 65 new jobs over the next 5 years as part of its expansion at the Rolla National Airport



Let us know what
you think.

www.MoFreightPlan.org

*Special thanks to Missouri Partners for their assistance in providing the local statistics and information in this factsheet.



**APR-MAY
2014**

Business forums

**JUN-SEP
2014**

Preview the draft plan

Appendix D - Stakeholder Outreach

ATTACHMENT 7: Kansas City District Profile

A Vision for Freight in Missouri >>

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**"If we don't maintain
access to our economic
development hubs, we lose
out on long-term growth."**

2013 On the Move Listening Session Participant

Recent developments in the Kansas City District increase reliance on freight networks

**DEC
2013**

Aspen Contracting, a Lee's Summit firm announced plans to add 300 jobs in its sales, production and project management operations.

Aviation Technical Services, is opening a 607,000 square foot facility in Kansas City, expected to create more than 500 new jobs over the next 3 to 5 years, with potential for 1,000 employees over time.

**NOV
2013**

Grupo Antolin North America, announced plans to invest more than \$15.7 million in a manufacturing facility to supply Ford's Kansas City Assembly Plant, creating an estimated 118 new jobs.

**SEP
2013**

BIME Analytics, opened its new North American headquarters in Kansas City's Crossroads District and is expected to hire 44 new employees within the next five years.

LightEdge Solutions, will open a new regional office in Kansas City making a \$58,357,912 capital investment and creating 21 new jobs.

**AUG
2013**

Cerner Corp. announced that it is moving forward with plans to extend its Missouri campus and bring between 12,000 and 15,000 jobs to Kansas City.



Let us know what
you think.

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**APR-MAY
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Business forums

**JUN-SEP
2014**

Preview the draft plan

The Kansas City District and Freight >>

MoDOT's Kansas City District has nine counties covering more than 5,650 square miles. Residents of Missouri's Kansas City region enjoy an excellent quality of life with the cost of living far below the national average, and good access to excellent hospitals, educational institutions, cultural amenities and outdoor recreation. Kansas City, Independence and Lee's Summit are the largest cities in the district. Growing industries include advanced energy, biosciences, data centers, engineering, and manufacturing. Many major companies are headquartered in the KC region including Cerner Corporation, Hallmark and H&R Block.

Freight moves by multiple transportation modes in the Kansas City District. Major area roads include I-29, I-35, I-49, I-70, I-435, I-470, I-635 and I-670 as well as US-24, US-40, US-50, US-56, US-65, US-69 and US-169. Kansas City International Airport is the area's largest airport and one of only two major commercial airports in the state. Major rail access is provided by Burlington Northern Santa Fe, Central Midland, Canadian Pacific, Kansas City Southern, Kaw River, Missouri & Northern Arkansas, Norfolk Southern and Union Pacific. Kansas City is the largest rail hub in the nation in terms of tonnage. The region also has a Missouri River port in Kansas City.



What have we heard locally? >>



The Kansas City community is proud of its status as one of the largest rail freight and trucking hubs in the country. Stakeholders commented that integrating different freight modes is important regionally and nationally. Assets in this district include a rapidly growing Foreign Trade Zone and the BNSF multi-modal facility located across the state line in Kansas, which will have the largest speculative space in the country.



Capacity upgrades to I-70 are a top priority in the Kansas City District as well as across the State. The importance of the I-70 corridor to freight movement is echoed throughout all of the districts. Additional lanes were suggested to provide better reliability along the corridor. Other top priority corridors identified included I-49 and the south leg of I-435.



Private sector engagement is a crucial part of crafting a meaningful freight plan. Stakeholders suggest that key businesses, including railroads, should be brought into crafting the plan and that the best way to do that is through cultivating relationships and building trust. In addition, information on private sector freight movements that has not been available in the past is needed for a complete freight picture and a plan that enhances economic development in the State.



The increase in the use of e-commerce is changing the way that freight stakeholders conduct business and will require a freight system that accommodates that shift. Stakeholders pointed out that more distribution centers will lead to greater pressure on roadways.



What have we heard throughout the state? >>

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KANSAS CITY DISTRICT



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Investigate possibilities for utilizing waterways. Stakeholders see potential for growth on the Missouri and Mississippi Rivers but consistently brought up concerns including frequency of dredging, lack of improvements to the lock and dam system and inconsistent water levels. The expansion of the Panama Canal was also mentioned by stakeholders who want to make sure the state is positioned to take advantage of potentially increased freight flow and remain competitive. Stakeholders are concerned about low water levels and the impacts to operations if dredging frequency decreases.

Appropriately funding freight transportation projects is a key stakeholder concern. Stakeholders voiced a need to preserve the existing freight network and systems, but also said that improvements and enhancements are key to growing the state’s economy.

Appendix D - Stakeholder Outreach

ATTACHMENT 8: Northeast District Profile

A Vision for Freight in Missouri >>



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The Northeast District and Freight >>

MoDOT's Northeast District has 17 counties covering more than 9,000 square miles. Residents of Missouri's northeast region enjoy an excellent quality of life with the cost of living far below the national average, and good access to excellent hospitals, educational institutions and outdoor recreation. Hannibal, Kirksville, Moberly, Mexico, Troy and Warrenton are the largest cities in the district. Top industries include agribusiness, food processing, and manufacturing. Major employers include ConAgra, General Mills, Kraft and Tyson.

Freight moves by multiple transportation modes in the Northeast District. Major area roads include I-70 and I-72 as well as US-24, US-36, US-54, US-61, US-63 and US-136. A regional airport is located in Kirksville. Major rail access is provided by Burlington Northern Santa Fe, Norfolk Southern, Kansas City Southern and Union Pacific. The region also has a Mississippi River port facility at Lewis County.



What have we heard locally? >>



Capacity expansion and maintenance of highway networks are essential to ensuring network reliability. Specific examples of maintenance issues provided by stakeholders included US-36 from Shelbina to Hunnewell and Monroe City and along US-61 between Palmyra and Hannibal. Road surfaces in many sections are "rougher than a cob." Capacity issues include too much truck traffic on I-70, and bottlenecks on US-61 in Hannibal and on the I-70 interchange in Warrenton.



Future growth is threatened by railroads closing local crossings and spurs and removing scales in this district.



Locks and dams along the Mississippi River need improvement. Port stakeholders in this region mentioned the deteriorating condition of the lock and dam system as a challenge for Missouri freight in the future.



What have we heard throughout the state? »

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Appropriately funding freight transportation projects is a key stakeholder concern. Stakeholders voiced a need to preserve the existing freight network and systems, but also said that improvements and enhancements are key to growing the state’s economy.

NORTHEAST DISTRICT



**Every \$1
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in economic
activity.**

**"If we don't maintain
access to our economic
development hubs, we lose
out on long-term growth."**

2013 On the Move Listening Session Participant

Recent developments in Northeast Missouri increase reliance on freight networks

**JUN
2013**

Bodine Aluminum, a wholly-owned subsidiary of Toyota Motor Corp. and a manufacturer of casting parts, will invest \$50 million and create 40 new jobs at its plant in Troy, Mo.

Hartzell Hardwoods announced an expansion of operations less than a year after opening its doors in Kirksville, adding more than a dozen new employees. Hartzell recently added 15 employees to support expanded operations, all of which was enabled by a 35,000-square-foot warehouse addition and 22,000 square feet of buildings constructed to dry hardwood lumber and store materials.

Calumet Specialty Products Partners, a leading specialty hydrocarbon producer, is planning a significant expansion of their esters production facility in Louisiana. Expansion plans include up to \$40 million in capital investment and an expected creation of 21 new jobs.

**APR
2013**

CertainTeed, a leading North American corporation that manufactures materials for commercial and residential builders, announced plans to build a new Midwest production and distribution center in Jonesburg making a capital investment of \$100 million in an expansion that is expected to create 100 new local jobs.



Let us know what
you think.

www.MoFreightPlan.org

Special thanks to Missouri Partners for their assistance in providing the data, statistics and information in this factbook.



**APR-MAY
2014**

Business forums

**JUN-SEP
2014**

Preview the draft plan

Appendix D - Stakeholder Outreach

ATTACHMENT 9: Northwest District Profile

A Vision for Freight in Missouri >>

FREIGHT ON THE Move

As part of our On the Move initiative in 2013, MoDOT talked with thousands of Missourians in all 114 counties about our state's transportation future. We learned that Missourians want a transportation system that is well maintained, safe, grows our economy and leads to job creation, and provides Missourians with more interconnected travel options.

Freight moved by truck, train, barge and plane is an essential part of Missouri's economy and growth. Making smart investments in our freight transportation system can provide better options for Missouri businesses to get their products to market. An improved freight transportation system can also lower transportation costs and help create more jobs. Because freight is key to Missouri's vitality, MoDOT is developing a freight plan -

Missouri freight is expected to increase dramatically from **600+ million** tons in 2011 to an estimated **1 billion** tons in 2040.

In 2012, Missouri ported

ex-\$13.9

MoDOT

The Northwest District and Freight >>

MoDOT's Northwest District has 20 counties covering more than 10,770 square miles. Residents of Missouri's northwest region enjoy an excellent quality of life with the cost of living far below the national average, and good access to excellent hospitals, educational institutions and outdoor recreation. St. Joseph, Chillicothe and Maryville are the largest cities in the district. Top industries in the region include agribusiness, animal health, and manufacturing, with major companies such as Farmland Foods, Boehringer Ingelheim Vetmedica, and Kawasaki Motors all choosing to locate their operations in the area.

Freight moves by multiple transportation modes in the Northwest District. Major area roads include I-29, I-229 and I-35 as well as US-24, US-36, US-59, US-65, US-69, US-71, US-136, US-159, US-169 and US-275. Regional airports are located in Cameron, Chillicothe, Maryville, St. Joseph and Trenton. Major rail access is provided by Burlington Northern Santa Fe, Canadian Pacific Railway, Missouri North Central, Norfolk Southern and Union Pacific. The region also has a Missouri River port facility in St. Joseph.



What have we heard locally? >>



Farm-to-market routes are essential to the region's economy. Rail access in this region is decreasing, so lettered routes are very important, not only for moving agriculture goods, but also as connections for manufacturers to highways and interstates.



Road capacity upgrades are important in the region. Despite I-70 passing outside of the district to the south, stakeholders indicated that it should be improved to a six-lane facility. Stakeholders also suggested increasing capacity to four lanes between I-29 and I-35 through Maryville. US-36 is an important corridor for business owners and should be considered for interstate designation. One private truck freight fleet operator called US-36 a "national best-kept secret." He explained that it is a safer route and that it saves his drivers an hour in drive time to Indianapolis.



There is a dwindling rail presence in the district. Stakeholders pointed out that there were more freight rail options in the past and many of those options no longer exist in the district.



Economic development efforts, such as the Eastowne Business Park in St. Joseph, need adequate roadway access. In addition, food industry businesses, such as Farmland Foods, could benefit from investment in intermodal access.



Low water levels and water quality in the district port and throughout the State concern stakeholders, as does local funding for the port.



What have we heard throughout the state? >>

MoDOT is strategically reaching out to key freight and industry stakeholders, such as logistics directors, shipping managers, and economic development professionals to discuss freight issues, needs, concerns, and opportunities in the state.

To date, MoDOT has received input from more than 180 key freight stakeholders through one-on-one interviews, district freight forums and surveys. Recurring themes from the state and each district are emerging and include:



Missouri generally has a well-connected and functioning road network until there is a hiccup, such as congestion, weather or construction. Stakeholders also identified a need for capacity and maintenance improvements to maintain reliability of interstates and minor routes.



Missouri is a "crossroads for the continent" and has a vast freight network that is an asset for retaining existing businesses and attracting new business. Stakeholders voiced concern that not all modes are readily accessible and well connected with other modes (e.g. rail to water ports) and that work needs to be done to integrate the freight modal networks.



There is a need to engage additional stakeholders to help guide the freight plan. Previous efforts have lacked private sector engagement. Over the last several years MoDOT has collaborated with several private sectors groups on successful projects. This is an opportunity to build on those relationships, share information and continue to collaborate.

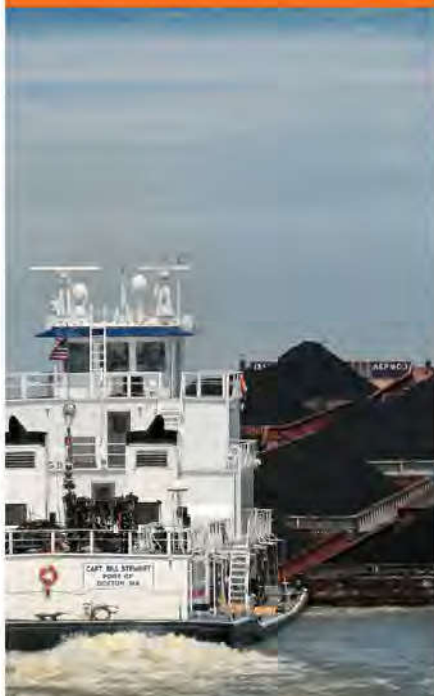


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NORTHWEST DISTRICT



Appendix D - Stakeholder Outreach

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2013 On the Move Listening Session Participant

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in economic
activity.

Northwest Missouri
networks

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OCT
2013

Recent developments in No
increase reliance on freight

PAC Customer Services, an Illinois-based company, i
nounced plans to expand into the St. Joseph market, a
345 new jobs to a local call center.

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ne vital
cts sheet

System and Services Technology, Inc. (SST) will add 345
new jobs at its St. Joseph service center. USA 800 will add at
least 250 full-time employees to its staff in St. Joseph.

IBC North America and Clean Tide Container announced

"Special thanks to Missouri Part
for their assistance in providing th
statistics and information in this fa

Appendix D - Stakeholder Outreach

ATTACHMENT 10: St. Louis District Profile

A Vision for Freight in Missouri >>



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Freight moved by truck, train, barge and plane is an essential part of Missouri's economy and growth. Making smart investments in our freight transportation system can provide better options for Missouri businesses to get their products to market. An improved freight transportation system can also lower transportation costs and help create more jobs. Because freight is key to Missouri's vitality, MoDOT is developing a freight plan -- with your help.

Freight Plan Goals >>

The plan will build on On the Move and alongside Missourians and our freight partners, we will identify opportunities and actions in the Freight Plan to increase economic development and jobs. The Freight Plan is a "deeper dive" into one of the critical areas identified through On the Move.

Trucks are expected to remain an important part of freight movement in Missouri, but more and more shipments are anticipated to use multiple modes of transportation. By connecting different modes of transportation, we can deliver products faster and more cost-effectively. And that's good for Missouri businesses and consumers alike.

The Freight Plan will help MoDOT meet the current and future needs of Missouri businesses. In November 2013, we began working on the plan. Our goal is to have a final Freight Plan ready by September 2014.



Appendix D - Stakeholder Outreach

The St. Louis District and Freight >>

MoDOT's St. Louis District has four counties and the City of St. Louis. Residents of Missouri's St. Louis region enjoy an excellent quality of life with the cost of living far below the national average, and good access to excellent hospitals, educational institutions, cultural amenities and outdoor recreation. St. Louis, O'Fallon, St. Charles and St. Peters are the largest cities in the district. Leading industries include plant and medical sciences, advanced manufacturing, information technology, financial services, transportation and distribution. Nine Fortune 500 firms are headquartered in the region.

Freight moves by multiple transportation modes in the St. Louis District. Major area roads include I-44, I-55, I-64 and I-70, I-170, I-255 and I-270 as well as US-40, US-50, US-61 and US-67. Lambert-St. Louis International Airport is the area's largest airport and one of only two major commercial airports in the state. Major rail access is provided by Burlington Northern Santa Fe, Canadian National, CSX, Norfolk Southern and Union Pacific. St. Louis is the third largest rail hub in the nation. The Port of St. Louis is the busiest inland port in the United States. In addition to St. Louis, there is an active port in Jefferson County.



What have we heard locally? >>



St. Louis is challenged to compete as a freight hub, and focus should be placed on developing opportunities for intermodal activities and international export. Stakeholders said transforming St. Louis to a major freight hub status is needed to grow the regional economy. While "St. Louis tends to be a pass-through," there are opportunities to develop additional facilities, particularly as an alternate freight hub to Chicago, which is highly congested. Stakeholders would like the public to be better informed on how freight transportation infrastructure supports the economy and jobs.



Congestion on I-70 and I-44 causes costly delays and some safety concerns.



It is difficult to move freight from ports and airports directly to destinations. Better connectivity is needed between the freight modes. Stakeholders are concerned about the difficulty businesses have in making the "last-mile connections." This issue was recently raised when trying to attract large economic development deals to the region.



Air cargo facilities are available at Lambert Airport, but they are dated and small.



Deficient bridges in the district could cause costly delays and pose safety concerns for carriers.



There is a shortage of available motor carriers and truck fleets as it is becoming increasingly difficult to recruit and insure drivers, and many fleets have left St. Louis. These shortages are driving up costs to move freight on roadways.



What have we heard throughout the state? »

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Investigate possibilities for utilizing waterways. Stakeholders see potential for growth on the Missouri and Mississippi Rivers but consistently brought up concerns including frequency of dredging, lack of improvements to the lock and dam system and inconsistent water levels. The expansion of the Panama Canal was also mentioned by stakeholders who want to make sure the state is positioned to take advantage of potentially increased freight flow and remain competitive. Stakeholders are concerned about low water levels and the impacts to operations if dredging frequency decreases.



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ST. LOUIS DISTRICT



Appendix D - Stakeholder Outreach

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2013 On the Move Listening Session Participant

Recent developments in the St. Louis District increase reliance on freight networks

DEC
2013

Boeing announced plans to add up to 400 additional research and technology jobs at its St. Louis County campus. This is the second major St. Louis jobs announcement this year.

Client Services Incorporated (CSI), a call center with clients in the financial services, healthcare, customer care, and utilities industries, announced plans to add 300 full-time account representatives and 100+ part-time positions over the next 6 months.

NOV
2013

Cofactor Genomics opened a new \$3.8 million headquarters and laboratory facility in St. Louis. As part of this expansion, the company plans to hire 24 new employees, tripling its current employment.

IKEA announced plans to build a 380,000 square foot store in midtown St. Louis. The project is expected to bring about 500 construction jobs, and IKEA says it will hire 300 full-time workers.

OCT
2013

Clayton-based Enterprise Holdings, the nation's largest rental car company, announced plans to hire 11,000 new full-time workers by mid 2014, including about 500 in St. Louis.



Let us know what
you think.

www.MoFreightPlan.org

Speedy thanks to Missouri Partnership
for their assistance in providing the vital
statistics and information in this factsheet.



APR-MAY
2014

Business forums

JUN-SEP
2014

Preview the draft plan

Appendix D - Stakeholder Outreach

ATTACHMENT 11: Southeast District Profile

A Vision for Freight in Missouri >>

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The Southeast District and Freight >>

MoDOT's Southeast District has 25 counties covering more than 16,000 square miles. Residents of Missouri's southeast region enjoy an excellent quality of life with the cost of living far below the national average, and good access to excellent hospitals, educational institutions and outdoor recreation. Cape Girardeau, Poplar Bluff and Sikeston are the largest cities in the district. Top industries include agribusiness, manufacturing, life sciences and transportation/logistics. Major employers include Procter & Gamble and Tyson.

Freight moves by multiple transportation modes in the Southeast District. Major area roads include I-55, I-57 and I-155 as well as US-60, US-61, US-62 US-63, US-67, US-160 and US-412. Regional airports are located in Cape Girardeau, New Madrid and Sikeston. Major rail access is provided by Burlington Northern Santa Fe and Union Pacific. The region also has Mississippi River port facilities at SEMO Port in Scott City, Mississippi County, New Madrid County, Pemiscot County and Ste. Genevieve County.



What have we heard locally? >>



East-west connectivity is limited regionally and a St. Louis bypass could help congestion. Capacity concerns in the St. Louis area led many stakeholders to suggest an east-west or diagonal corridor to provide "this area a direct route through central Missouri" as an alternative to the longer I-55/I-70 route. Another interviewee said Missouri "needs an 'X' through the middle of the state to connect southeast Missouri with Kansas City and Kirksville to Joplin and Springfield." Stakeholders also suggested a freeway-type roadway (i.e. four-laning US-60 across the state).



US-67 is a key north-south connection, and completing the route through Arkansas would increase economic opportunities.



Industry relies on secondary highways for time-sensitive delivery and connections to interstates, and the condition of these roadways could be improved. Several stakeholders suggested resurfacing and capacity upgrades.



Stakeholders are concerned about funding for ports and waters for small-level capital projects. Additionally, several stakeholders commented about the need for consistent support of dredging.



What have we heard throughout the state? »

MoDOT is strategically reaching out to key freight and industry stakeholders, such as logistics directors, shipping managers, and economic development professionals to discuss freight issues, needs, concerns, and opportunities in the state.

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SOUTHEAST DISTRICT



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2013 On the Move Listening Session Participant

Recent developments in Southeast Missouri increase reliance on freight networks

**JUL
2013**

Noranda Aluminum Holding Corporation, a leading North American producer of aluminum, announced plans to significantly expand the footprint of its smelter in New Madrid. The facility expansion includes a \$45 million capital investment and is expected to create 29 new jobs.

**APR
2013**

Marquis Missouri Terminal, LLC announces it will double the throughput capacity and construct an additional barge dock in the Pemiscot County Port Authority slip.

**JAN
2013**

AT&T, announced it would hire more than 30 new full-time employees at its Cape Girardeau call center.

**MAR
2012**

TG Missouri, an auto supply plant in Perryville, announced a \$39-million expansion, which will result in 200 new jobs over the next 5 years.



Let us know what
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**APR-MAY
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Business forums

**JUN-SEP
2014**

Preview the draft plan

Appendix D - Stakeholder Outreach

ATTACHMENT 12: Southwest District Profile

A Vision for Freight in Missouri >>



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The Southwest District and Freight >>

MoDOT's Southwest District has 21 counties covering more than 13,000 square miles. Residents of Missouri's southwest region enjoy an excellent quality of life with the cost of living far below the national average, and good access to excellent hospitals, educational institutions and outdoor recreation. The region's immediate proximity to major freight operations in Northwest Arkansas presents a unique dynamic for the area. Springfield and Joplin are the largest cities in the district. Top area industries include transportation/logistics, information technology, manufacturing and warehousing/distribution. Major employers include 3M, Bass Pro Shops, La-Z-Boy, General Mills, and Jack Henry & Associates and O'Reilly Automotive.

Freight moves by multiple transportation modes in the Southwest District. Major area roads include I-44 and I-49 as well as US-54, US-60, US-65, US-71, US-160 and US-166. Regional airports include Clinton Memorial Airport, Joplin Regional Airport, Springfield-Branson National Airport. Major rail access is provided by Arkansas & Missouri, Burlington Northern Santa Fe, Kansas City Southern and Missouri & Northern Arkansas.



What have we heard locally? >>



Interstate capacity upgrades are needed. Many stakeholders suggested adding lanes to I-70 and I-44. "I-44 is aging out and will need additional capacity as the population increases in the region." Congestion on these interstate corridors is a top concern for many, especially in urban areas. One stakeholder recommended completing I-49 to the Arkansas state line.



Motor carrier accommodation and recruitment is a high priority in this district. A recurring theme from stakeholders is the need for better accommodations for motor carriers, such as improved and larger rest areas. In addition, stakeholders are interested in motor carrier recruitment, driver training programs for the general public to increase safety on roadways, and less regulation on drivers.



Funding programs for freight should be flexible so each district can target their specific needs, regardless of mode.



What have we heard throughout the state? »

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SOUTHWEST DISTRICT



Appendix D - Stakeholder Outreach

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2013 On the Move Listening Session Participant

Recent developments in Southwest Missouri increase reliance on freight networks

**DEC
2013**

Watson Metal Masters announced plans to invest \$4.8 million in new manufacturing facility in Republic, expected to create 77 new jobs.

Stainless Technology, a manufacturer of stainless steel tanks, announced plans to expand its Springfield operations. The company plans to hire up to 88 new employees, more than doubling the current workforce at the facility.

**OCT
2013**

AT&T announced plans to add 65 new positions at their Joplin call center.

**SEP
2013**

TSI, will add three engineers in Springfield, bringing the company total to 145 employees.

**AUG
2013**

Leggett & Platt announced a \$5.1 million expansion of their Carthage Flex-O-Lators facility, which manufactures automotive seating components, adding 28,000 square feet and an expected 12 jobs.

**JUL
2013**

Aegis Limited announced plans to hire 300 people for its Joplin call center over the next 4 months.



Let us know what
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**APR-MAY
2014**

Business forums

**JUN-SEP
2014**

Preview the draft plan

Priorities and Investment Forum Presentation

ATTACHMENT 13: Statewide Presentation



Priorities & Investments Freight Webinar

MoDOT Statewide Freight Plan
May 13, 2014



Today's Focus



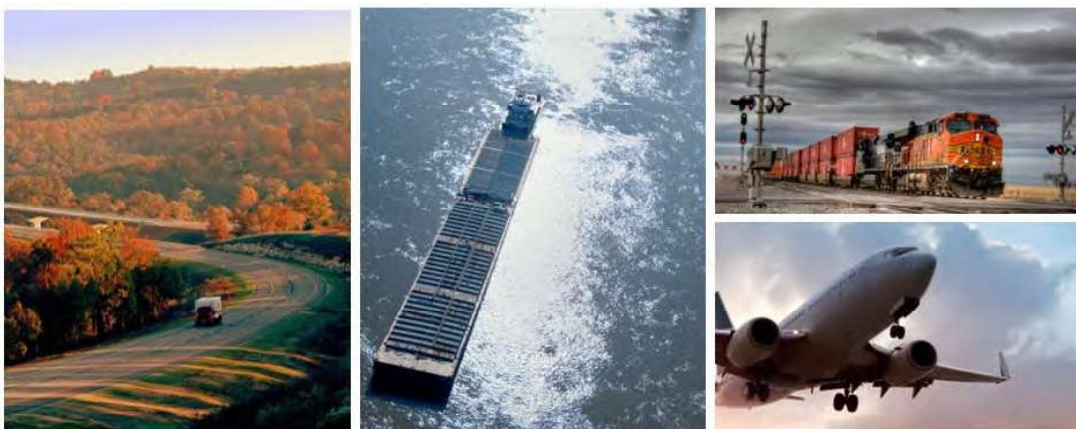
How can MoDOT best prioritize freight investments?



What types of projects are most important in this area?

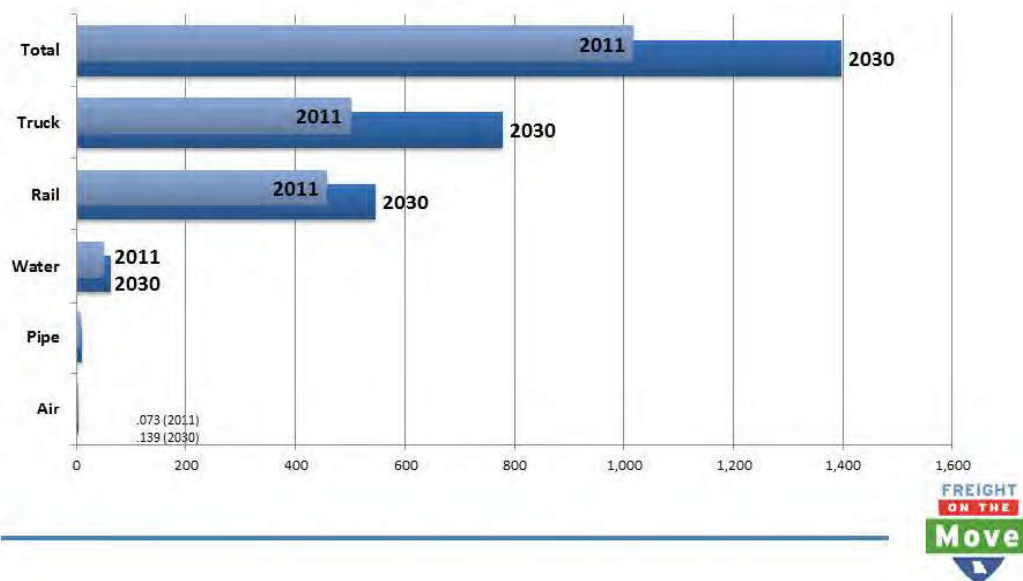


Trends & Needs



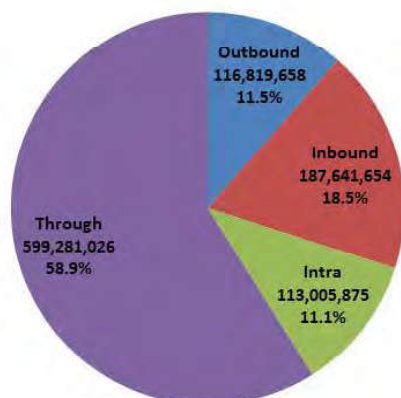
Freight Growth

Tonnage Forecast (Millions) by Mode, 2011 to 2030



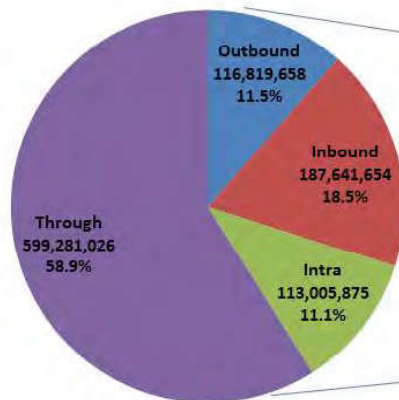
Freight Movements

Tonnage by Direction, 2011

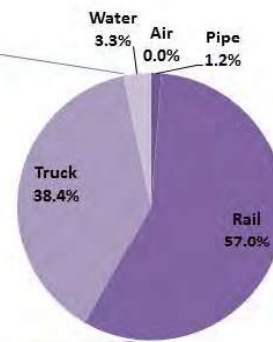


Freight Movements

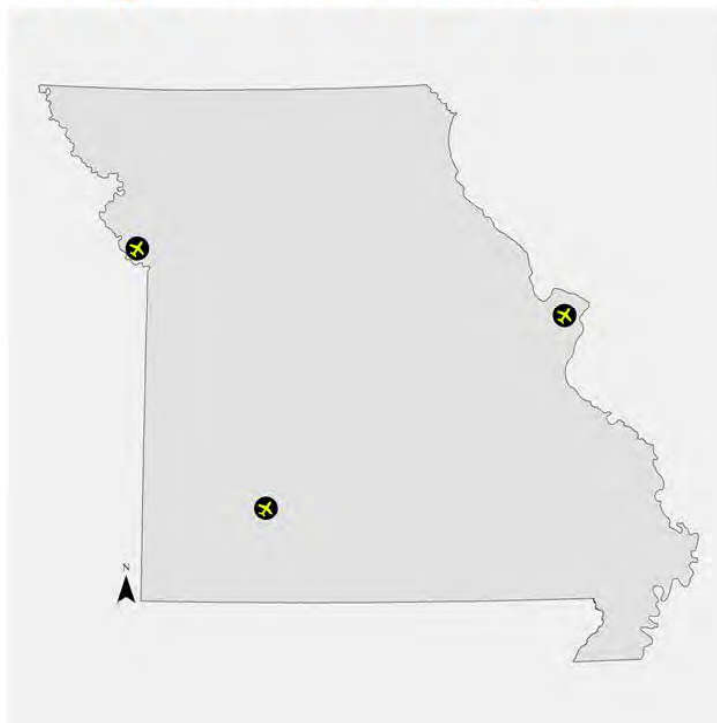
Tonnage by Direction, 2011



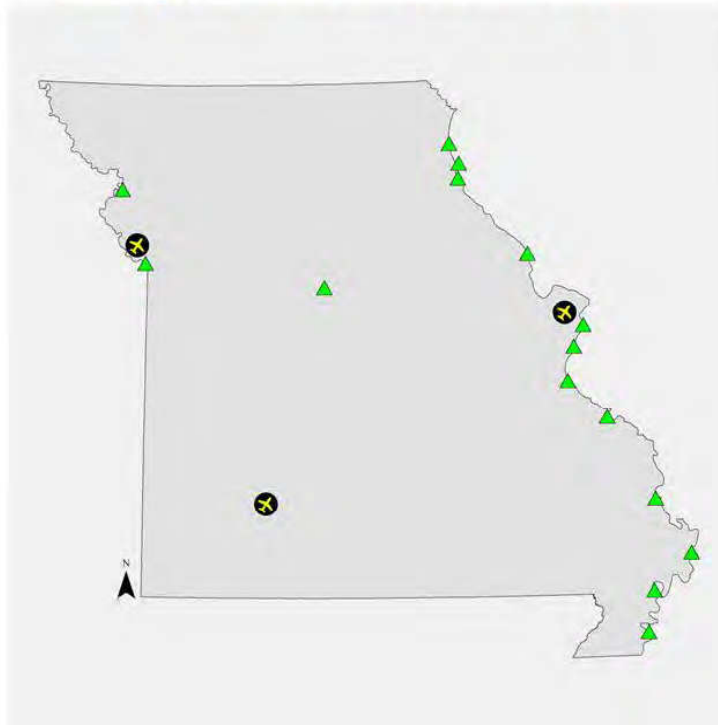
Through Movement by Mode



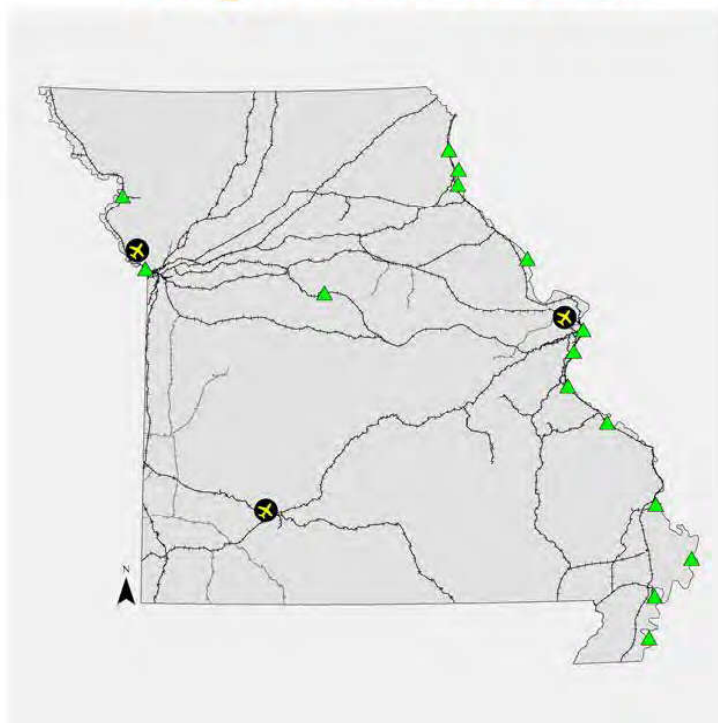
Freight Network-Airport



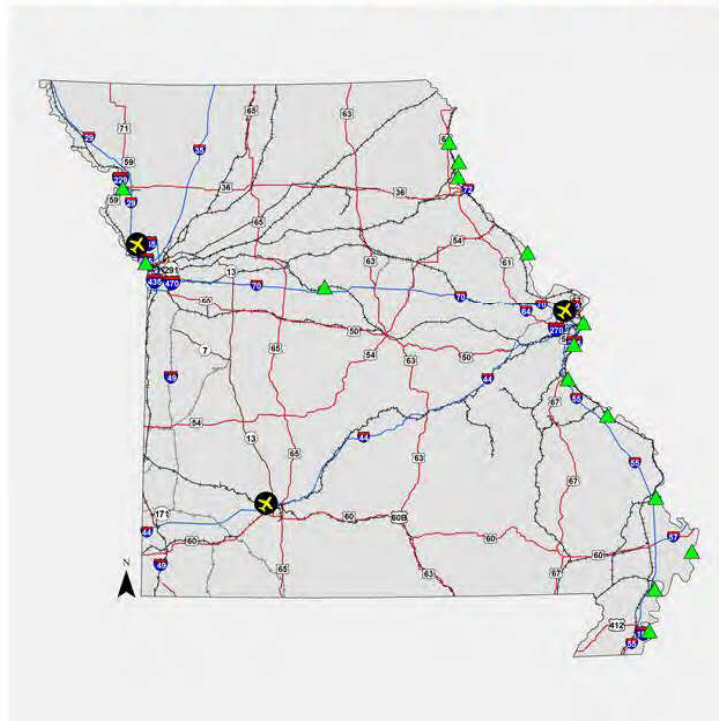
Freight Network-Ports



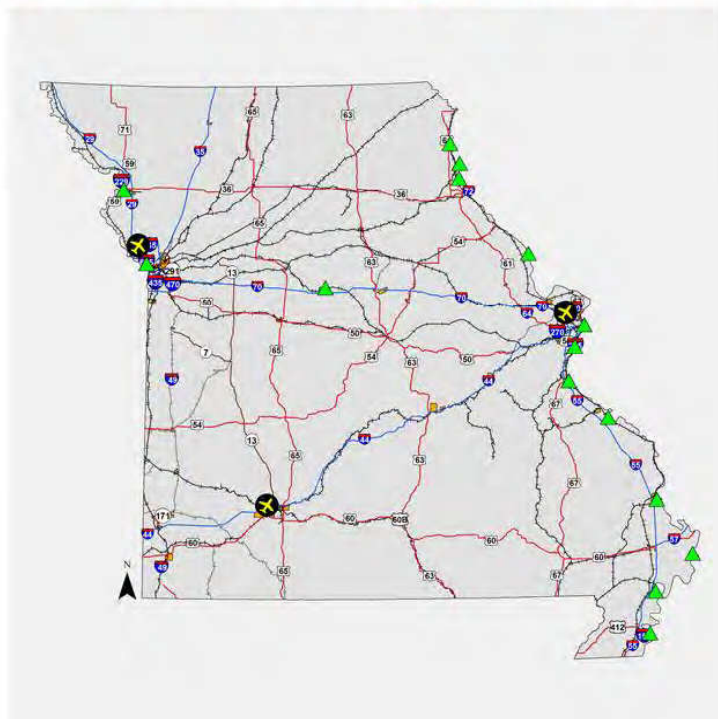
Freight Network-Rail



Freight Network-Highways



Freight Network-Freight Generators





Why reach out?

costs

Why reach out?



**What if more funds
become available?**

Why reach out?

**Stakeholders know best
which projects and policies
can make businesses more
competitive**

Purpose of the Freight Plan

Building on *On the Move* and through **collaboration with freight partners**, we will **identify opportunities and actions** in the Freight Plan to **increase economic development and jobs**.



Project Prioritization Framework

Purpose is to help decision makers **evaluate future freight network investments** to meet freight goals.

Filters reflect **goals and measures** developed through robust stakeholder involvement.



Freight Goals Align with Long Range Plan Goals

Long Range Plan Goals

Take care of the transportation system

Keep all travelers **safe**, no matter the mode of transportation

Invest in projects that spur **economic growth** and create jobs

Give Missourians better transportation **choices**

Freight Plan Goals

Maintain the freight system in good condition

Improve **safety** on the freight system

Support **economic growth** and competitiveness in Missouri

Improve the **connectivity and mobility** of the freight system

Initial Prioritization Requirements

- Projects are located on, linked to, or within the prescribed buffer for the designated **Missouri Freight Network**.
- High cost capital improvement or major **maintenance** projects / Routine maintenance, operations and planning projects **not included**.
- Project is **consistent with selected plan goals and modes**.
- Project is **eligible for federal or state funding**.



Prioritization Framework Examples

Maintenance

- Maintains existing freight network

Safety System

- Improves a high crash location

Economic Development

- On a link of high economic value
- Connects economically distressed areas
- Improves access to freight generator
- Expands or modernizes facilities to support freight

Connectivity & Mobility

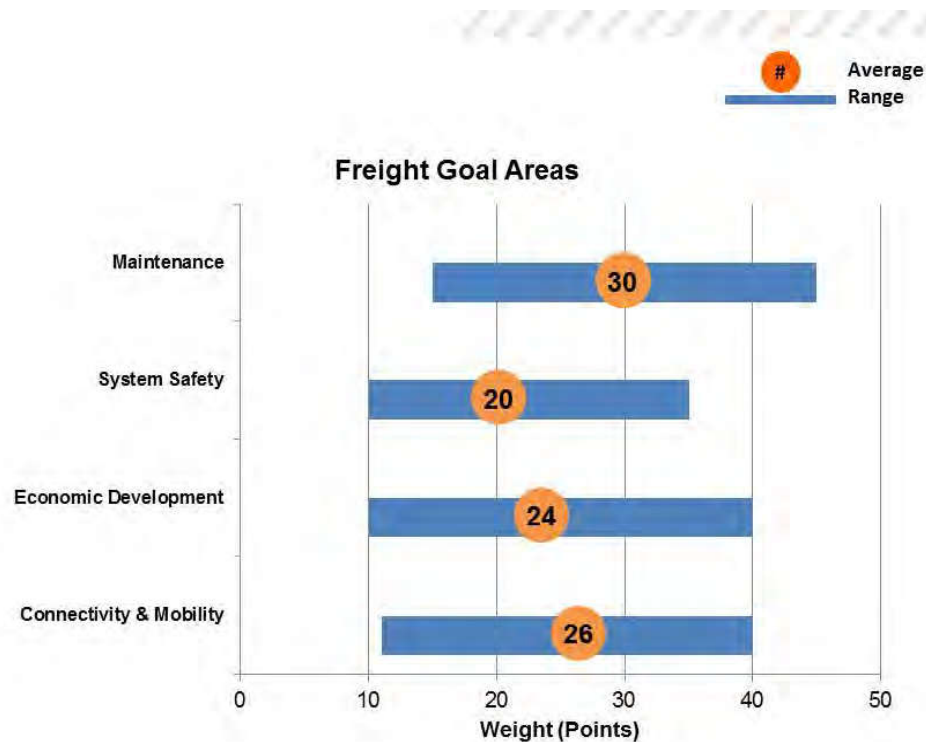
- Adds capacity to the system
- Improves first/last mile connections
- Removes or improves bottleneck
- Addresses substandard infrastructure

Appendix D - Stakeholder Outreach

Freight On The Move
Goals and Filters Weighting Form

Table # _____

Freight Goal Weight	Freight Filter	Filter Weight
Maintenance	Maintains existing freight network	<input type="text"/>
	Other: _____	<input type="text"/>
	Other: _____	<input type="text"/>
System Safety	Improves a high crash location	<input type="text"/>
	Other: _____	<input type="text"/>
	Other: _____	<input type="text"/>
Economic Development	On a link of high economic value	<input type="text"/>
	Connects economically distressed areas	<input type="text"/>
	Improves access to freight generator	<input type="text"/>
	Expands or modernizes facilities to support freight	<input type="text"/>
	Other: _____	<input type="text"/>
Connectivity & Mobility	Adds capacity to the system	<input type="text"/>
	Improves first/last mile connections	<input type="text"/>
	Removes or improves bottleneck	<input type="text"/>
	Addresses substandard infrastructure (weight restricted bridges or track, railroad vertical clearance, river crossing, etc.)	<input type="text"/>
	Other: _____	<input type="text"/>
	Other: _____	<input type="text"/>
100	100	



What Project Types Make Sense?



Highway

- Ramp projects
- Outer road projects
- Corridor operational improvements
- Corridor extensions
- Intersection improvements
- **Continuous safety improvements**
- **General capacity improvements (additional lanes)**
- Third-lane, super-two, passing lanes
- New and/or modified interchanges
- Freeway/highway bypasses
- Bridge improvements and/or replacements
- New river crossings
- **New truck arterials**
- **Rest area and parking improvements**

Improvements and adding capacity to I-70 was the top reoccurring theme

Rail

- **Grade separation**
- **Spur lines to industrial parks**
- Rail line improvements
- **At-grade crossing improvements**
- New river crossings
- Third mainline track
- Rail bridge improvements
- Asset management program
- Lighted crossings
- Terminal improvements
- New siding
- Double tracking
- Universal crossover

Waterway/Port

- Land acquisition
- Dock improvements
- Landing and terminal improvements (buildings, storage facilities, equipment)
- **Port road improvements**
- Bank stabilization
- **Container handling**
- Floodwall improvements
- Utilities upgrade
- **Harbor dredging**

Aviation

- **Gate access, facility location**
- Safety management system
- Airport cargo area connection improvements
- **Links to industrial areas**

Intermodal

- **Multimodal connection enhancements**
- Rail-to-port connections (spur and siding improvements, dock transfer)
- Truck-to-air connections
- Truck-to-rail connections
- Food industry-related intermodal facility
- U.S. highway access road improvements

Discussion

MoFreightPlan.org

<https://www.surveymonkey.com/s/MoDOTFreightSurvey>



Next Steps

- Draft plan ready end of June



Thank You!

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MoFreightPlan.org

Business Forum Summary

ATTACHMENT 14: Final Document



A Vision for Strategic Freight Investment

Building on *A Vision for Missouri's Transportation Future*, MoDOT's long range plan which established the vision for Missouri transportation, and through collaboration with freight partners, MoDOT is developing a Freight Plan to identify opportunities and actions that will increase economic development and jobs. Specifically, MoDOT wants to develop a method for prioritizing investments for improvements on the system.

Freight is a critical element in the Missouri economy and we need a plan to make sure we keep freight - and the Missouri economy - moving smoothly. The goal is to figure out what we can do that will make a difference to keep Missouri businesses competitive and growing and attract new businesses and jobs to the state.

Listening to Missourians

Missouri stakeholders, including logistics directors, shipping managers, and economic development professionals have provided critical input into the development of the Freight Plan.

MoDOT has worked to gather input from stakeholders through:

- **Statewide Steering Committee:** A group of senior MoDOT leadership, representatives of various freight modes, along with economic development professionals are guiding the development of the Freight Plan.
- **Stakeholder Interviews:** More than 50 freight stakeholders, community leaders and economic development professionals from across the state were interviewed to hear their ideas, views and concerns about the current freight transportation system and what actions MoDOT could take that would make Missouri more competitive.
- **Freight Forums:** MoDOT hosted two rounds of regional forums to give freight partners, business, and community leaders a chance to learn more about the Freight Plan, provide input on how MoDOT can best prioritize freight investments and on what types of projects are most important in the area.

Improvements large and small, from turning lanes for trucks to better rail and port connections, keep Missouri businesses competitive and growing and attract new businesses and jobs to the state.



Appendix D - Stakeholder Outreach

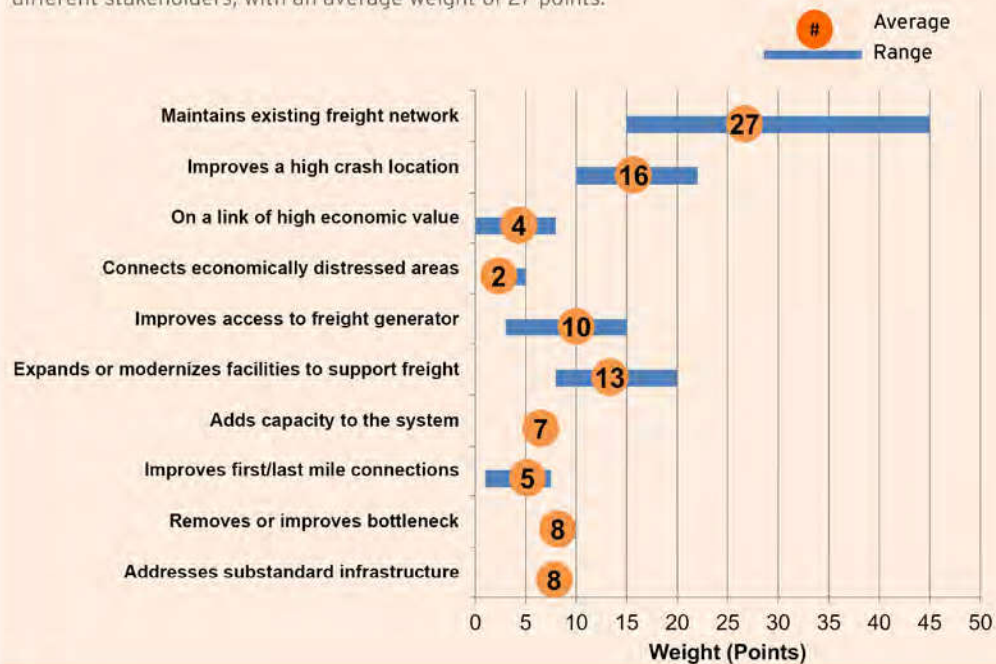
What We Heard – Project Prioritization Framework

As part of the Freight Forums held in early 2014, stakeholders were asked to provide feedback on how to best prioritize freight projects. Its purpose – to help decision makers evaluate future freight network investments to meet freight goals.

The Freight Plan goals were developed to align with MoDOT's Long Range Plan.

Long Range Plan Goals	Freight Plan Goals
Take care of the transportation system	Maintain the freight system in good condition
Keep all travelers safe, no matter the mode of transportation	Improve safety and security on the freight system
Invest in projects that spur economic growth and create jobs	Support economic growth and competitiveness in Missouri
Give Missourians better transportation choices	Improve the connectivity and mobility of the freight system

Based on stakeholder input, the top priorities for project selection are shown below. The blue lines represent the range of points that stakeholders assigned during the Freight Forums. The orange circles shows the average points from all the forums. For example, "Maintains existing freight network" received between 15 and 45 points from different stakeholders, with an average weight of 27 points.



Appendix D - Stakeholder Outreach

What We Heard - Project Types

Stakeholders were also asked to provide feedback on what types of freight projects would make sense in Missouri. Stakeholders who participated in forums, surveys and webinars across the state said maintaining the existing infrastructure is the highest priority. Additional high priorities in each freight mode are:

Roadways

- Roadway improvements that address first and last mile as well as accommodate wider and heavier loads
- Bridge improvements or replacements to accommodate wider, taller and heavier loads
- Adding lanes
- New truck arterials
- Truck parking facilities

Rail

- Spur lines to industrial parks
- At-grade crossing improvements and grade separations
- Transloading facilities to get from truck to rail and vice versa
- Rail line improvements

Waterway and Port

- Container handling
- Harbor dredging
- Infrastructure and terminal improvements (buildings, storage facilities, equipment)

Aviation

- Links to industrial areas
- Improved connections from airport cargo areas to other modes

How will this input be used?

MoDOT leaders understand how important freight movement is to the Missouri economy and are using the development of this Freight Plan to leverage economic development and identify strategic projects that will make significant improvements to the freight system. The information gathered will help MoDOT be prepared to address future freight issues and articulate what freight projects would be most helpful to the State if additional funds are made available.

A draft plan will be available in September.



Appendix D - Stakeholder Outreach

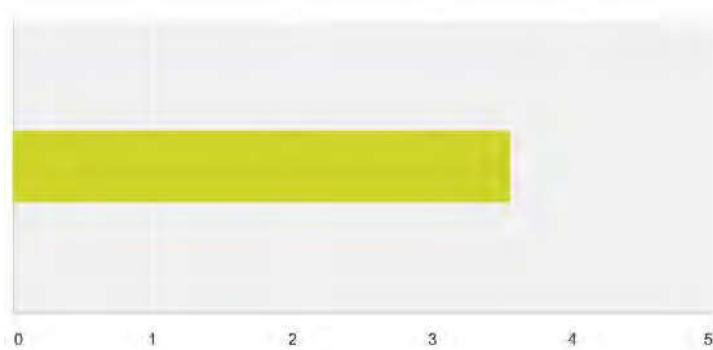


MoFreightPlan.org

Stakeholder Comment Period

ATTACHMENT 15: Stakeholder Survey

Q1: On a scale of 1 to 5, with 5 being the most important, how would you rate the current Missouri freight system?



1	2	3	4	5	No opinion	Total	Average Rating
0.00%	10.53%	36.84%	31.58%	15.79%	5.26%		
0	2	7	6	3	1	19	3.55

#	Other (please specify)	Date
1	Our highways are over crowded with trucks, and much of our rail infrastructure is decaying.	10/27/2014 6:58 AM
2	too many trucks ... too few interstates	10/22/2014 7:58 PM

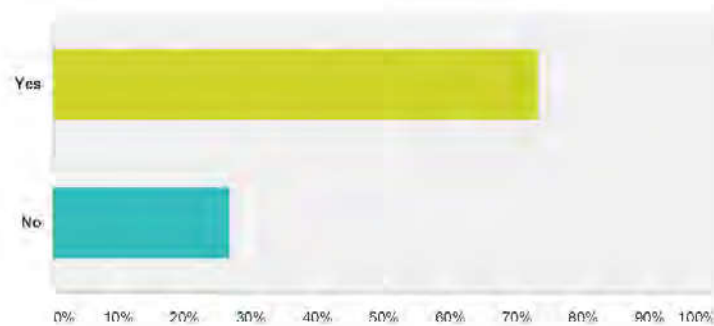
Appendix D - Stakeholder Outreach

Q2: How do you feel that freight movement affects your everyday life?

#	Responses	Date
1	Effective movement of freight does help keep end user product cost minimal.	10/27/2014 6:58 AM
2	Dangerous travel with so much truck traffic.	10/22/2014 7:58 PM
3	Very much, it is how I make a living.	10/18/2014 12:33 PM
4	Too many through-traffic trucks on state lettered highways. Could they not be designated to state numbered highways only? The lettered highways were NEVER designed or built to sustain such loads or speed limits, as many were constructed in the thirties, forties and fifties.	10/15/2014 11:35 AM
5	Freight carriers make interstate driving dangerous. Drivers often drive over the speed limit, do NOT slow down, do not move over, etc.	10/10/2014 3:24 PM
6	the items we buy that are not produced or manufactured here in our region probably travel via rail truck, barge, etc., so it is essential we have good infrastructure and policies in place.	10/3/2014 9:25 PM
7	Constantly	10/3/2014 10:45 AM
8	The lack of river freight affects all of us everyday in the form of emissions (trucks,rail) and roadway deterioration.	10/3/2014 8:34 AM
9	Determines the cost of goods and provides for increased standard of living.	10/2/2014 6:31 PM
10	Big trucks on the interstate system are apparently without much regulation. Missouri citizens are at risk every time they are on Missouri roads from incompetent, impaired big truck drivers almost all from out of state. Yet the money spent on the electronic warning signs on the interstate are used to chastise passenger vehicles to stay out of the way of trucks, give them plenty of room. All the while you can not drive 100 miles on 70 or I44 without being run off the road or threatened by an 18 wheeler. These out of state trucks kill our citizens then are given a traffic ticket and climb back in their trucks. Why is Missouri the only state between here and the Atlantic Ocean that does not have reduced speed for big trucks. Why do we not have signs up telling trucks they will be ticketed if they drive up hills 35 miles side by side blocking all lanes. This is not permitted in other states but is in Missouri. Why?	10/2/2014 4:39 PM
11	5	10/2/2014 2:03 PM
12	Somewhat	10/2/2014 10:10 AM
13	Very important. Since every thing that you have in your house had to come by truck on at least one leg of the journey into your life.	10/2/2014 9:39 AM
14	Heavy trucks need to slow down and allow safe passage of pedestrians and bicyclists. Trucks need to pay more in diesel tax and tolls on Hwy70 if there is expansion of lanes.	10/1/2014 2:57 PM
15	Adds to traffic congestion on the Interstates and damages roads.	10/1/2014 2:50 PM

Appendix D - Stakeholder Outreach

Q3: After reading the draft plan, do you feel like we missed anything?



Answer Choices	Responses	
Yes	73.33%	11
No	26.67%	4
Total Respondents: 15		

#	Additional comments	Date
1	I have always thought the the Rail line between St. Genevieve and Bismarck needs to be brought up to standard. Although the Union Pacific is uninterested in their own property, this line is of great economic importance to the communities that are located along it. Also with the new frac sand mine located in St. Genevieve county the railroad would not allow that industry to use the rail, which in turn causes more truck traffic to be on the roads between St. Genevieve and Bismarck MO, where the material is loaded on rail. I feel a short line railroad would be the best answer to this rail corridor.	10/27/2014 8:58 AM
2	Seems well rounded	10/22/2014 7:58 PM
3	Incentives to keep freight carriers in MO. (Cheaper longer-term licensing for vehicles, UCR, etc....) (Lower tax rates for carriers)	10/18/2014 12:33 PM
4	Restrict through-traffic trucks to state numbered highways only, where practical.	10/15/2014 11:35 AM
5	I did not really see anything about how interstate traffic would be improved -- such as NO Sunday truck traffic (like they have in Europe), designated truck lanes, increased night (10 pm - 6 am) driving and decreased day driving, etc.	10/10/2014 3:24 PM
6	only comment I could make is that selling this vision to the public so as to build support might be useful, but probably hard to do without spending a lot of advertising dollars.	10/3/2014 9:25 PM
7	In a thirty year time frame, there will be intense demand for infrastructure capable of accommodating Autonomous and semi-autonomous trucks. This will impose a huge financial burden but be ESSENTIAL to Missouri's economic competitiveness. We need to begin doing two things: preserving right-of-way, where likely to be required, and work with private interests on politically practical methods of funding the requisite assets as required over time.	10/3/2014 10:45 AM
8	Looking to the future, we should at least have a goal of "changing the pie chart" to show waterways percentage as increasing twofold in ten years.	10/3/2014 6:34 AM
9	Springfield has two major rail yards and four intersecting major highway arterials with relatively little urban sprawl to impede the flow of freight. With the limits and problems associated with maritime freight, why is Springfield not considered for a major freight hub? Also, future fuel prices and truck verses rail fuel cost should be more central to the discussion.	10/2/2014 6:31 PM
10	Did you think that the taxpayers of Missouri who drive passenger vehicles might be "stakeholders" in the Missouri Highway system and we might have an interest in not being killed by big trucks.?	10/2/2014 4:39 PM
11	Need to look at how do develop driving jobs with the shortage that is looming in the future it could be a real problem to move freight.	10/2/2014 9:39 AM
12	More emphasis on truck freight paying tolls and paying more in highway diesel taxes. Pedestrians/Bicyclists and public transit has been neglected far too long in favor of roads for trucks paid for by passenger vehicles. Trucks are responsible for the majority of damage to roads, there needs to be a use fee (tolls, highway diesel additional taxes)	10/1/2014 2:57 PM

Appendix D - Stakeholder Outreach

Q4: What issues or problems identified in the draft freight plan should be tackled first?

#	Responses	Date
1	Rail infrastructure	10/27/2014 6:58 AM
2	adding rail and waterway capabilities...	10/22/2014 7:58 PM
3	Restrict through-traffic trucks to state numbered highways only, where practical.	10/15/2014 11:35 AM
4	Funding, increasing rail lines and dedicated interstate lanes	10/10/2014 3:24 PM
5	infrastructure maintenance, while linked to expansion in some cases, cannot be allowed to be neglected. I would say it needs to be addressed first.	10/3/2014 9:25 PM
6	Incorporating rapidly evolving, mid 20th technologies into all decision making is the first problem. Figuring out how to fund essential new infrastructure is the most critical.	10/3/2014 10:45 AM
7	Dig deep and often. Mine every scrap of funding that can be used in by Missouri. Example below shows innovation (building an "articulated tug/barge vessel" by state transportation groups in the NE: Marine Highway Momentum from Maine Port Authority Posted by Paul "Chip" Jaenichen The more than 25,000 miles of navigable Great Lakes, rivers, and waterways that make up America's Marine Highway System are --and will remain-- a key economic asset. Our nation's marine highway routes and the tugs and barges that ply those marine highways help alleviate land-side congestion; accommodate future freight growth; and provide reliable, competitive alternatives for freight shippers. However, smooth sailing is not always guaranteed. For example, winter weather can cause the waters off the coasts of New England states --part of M-95, a crucial marine highway running all the way from Maine to Florida-- to be too rough for tugs to safely push or pull cargo-loaded barges. That's why DOT's Maritime Administration (MARAD) has supported the Maine Port Authority's development of a next-level cargo vessel designed specifically to handle that unique marine environment. In addition to increasing safety and reliability for mariners and shippers, the project shows great potential to reduce energy consumption and air emissions while offering relief to cars and trucks on the busy I-95 land-side corridor. This week, port officials took a major step forward in this effort by releasing a design for the first U.S. containerized articulated tug barge, or "ATB," made possible with funding from MARAD. Unlike a tug and barge combination, an ATB is mechanically linked, combining the economics of tug and barge operations with the speed, maneuverability, and heavy weather-reliability of a ship. The vessel proposed by the Maine Port Authority would support the Northeast Marine Highway Expansion Project's efforts to expand container-on-barge service between Newark, NJ; Boston, MA; and Portland, ME. Our strong support for development of this vessel is another in a long line of actions that prove this Administration's commitment to the future of marine transportation and to developing a truly multimodal freight system that increases capacity, supports economic growth, and provides viable alternatives for shippers. Since September 2009, through six rounds of our TIGER grants, this Administration has awarded more than \$100 million to projects developing and increasing use of America's marine highways. Additionally, MARAD has awarded \$6.3 million for marine transportation-related infrastructure and equipment through our Marine Highway Grant program, and we have funded \$700,000 for marine corridor studies. The Obama Administration and MARAD are proud to back America's Marine Highways --not just because they're environmentally-friendly and energy-efficient-- but also because we see their potential value in the future. Our nation's expanding population will increase the demands placed on our freight system, and America's waterways are largely-untapped assets with the available capacity our country's growth requires. With continued support from this Administration, and forward thinking efforts like the work of the Maine Port Authority, I have no doubt that America's Marine Highways will be in a position to keep America moving.	10/3/2014 6:34 AM
8	Rail line removals.	10/2/2014 6:31 PM
9	see above	10/2/2014 4:39 PM
10	Barge improvement of waterways Trucks Major Roads improved Rail-Better Crossing Safety	10/2/2014 2:03 PM
11	More specifics of actual ideas, less talk of theoreticals.	10/2/2014 10:10 AM
12	Interstate expansion.	10/2/2014 9:39 AM
13	Rail is a great way to take trucks off Missouri roads, focus on rail. Take a close look at oil trains running through Missouri.	10/1/2014 2:57 PM

Appendix D - Stakeholder Outreach

Q5: Would you like to add any other questions or comments?

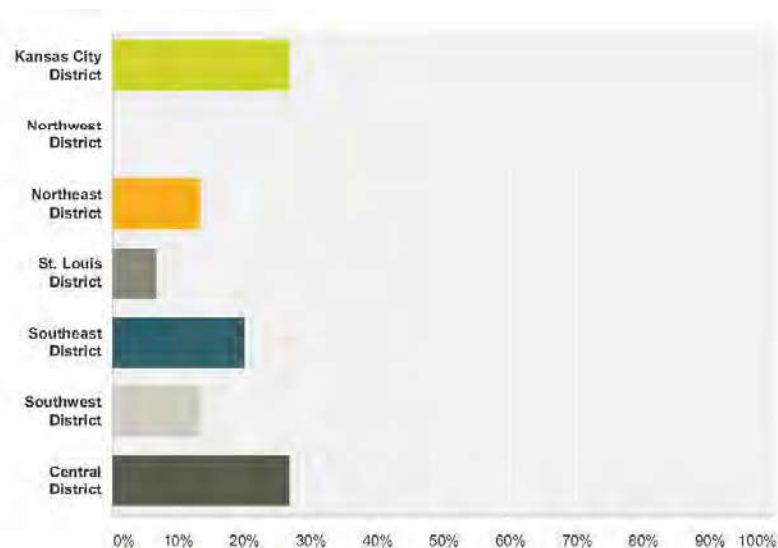
#	Responses	Date
1	Amtrak Service to Springfield would be a nice addition, although not freight, it would provide an alternative to the over crowded passage on I-44	10/27/2014 6:58 AM
2	we need to get back to Railroads....Much more efficient	10/22/2014 7:58 PM
3	Restrict through-traffic trucks to state numbered highways only, where practical.	10/15/2014 11:35 AM
4	Icedated your comments regarding the need for education about the importance of our freight network, and would like to add that it's important to educate others about the MO River and to strive to have it taken off the list of low use waterways. I overheard a conversation the other day that a representative from the Oklahoma Dept of Transportations was meeting with Kansas Corn Growers, the wheat association and also soybean farmers to express to them the importance of the Arkansas River. I think we need to reach out to our neighbors to the north and west and let them know that the MO River is navigable up to Souix City and that between Souix City and New Orleans, we have only one lock and Dam and that would be lock 27 in St. Louis. That equates to 1877 mile of river with only one area of potential problems, when people are looking at deteriorating infrastructure and delays due to closure.	10/14/2014 10:13 AM
5	We need to look at perhaps an alternate to trucks - such as rails -- and see if this is cost effective. I live in a town where there were rail lines and they took them up. We could use those now to help transport goods and keep truck traffic down. Also look at increasing truck traffic at night and decreasing it during the day, and perhaps banning it altogether on a Sunday such as in Europe. We need to look at ways rural areas could contribute to the freight program -- offering parking areas, truck stops, mechanic shops, etc., esp. along interstates.	10/10/2014 3:24 PM
6	Develop study groups that keep updated on all funding such as Tiger Grants, and innovative ways to use the grants on our waterways...	10/3/2014 6:34 AM
7	Why is Joplin part of the freight discussion?	10/2/2014 6:31 PM
8	No	10/2/2014 4:39 PM
9	Final results of freight-All freight at some point is necessary to be moved by Trucks-Major Roads must be maintained	10/2/2014 2:03 PM
10	The public needs to choose what they are paying for, then they will be more apt to supporting it. The online Wish List is a good approach, and should be used continuously, but needs to be fine tuned.	10/2/2014 10:10 AM
11	If I am driving 70 m.p.h. on I-70, I am constantly passed by trucks. Do they have to abide by the speed limit or not?	10/1/2014 2:50 PM

Appendix D - Stakeholder Outreach

Q6: Please provide the following demographic information (OPTIONAL).

Respondents provided contact information in response to this question.

Q7: Please identify which MoDOT district you reside or work in.



Answer Choices		Responses	
	Kansas City District	26.67%	4
	Northwest District	0.00%	0
	Northeast District	13.33%	2
	St. Louis District	6.67%	1
	Southeast District	20.00%	3
	Southwest District	13.33%	2
	Central District	26.67%	4
Total Respondents: 15			
#	Other (please specify)	Date	
	There are no responses.		

Appendix D - Stakeholder Outreach

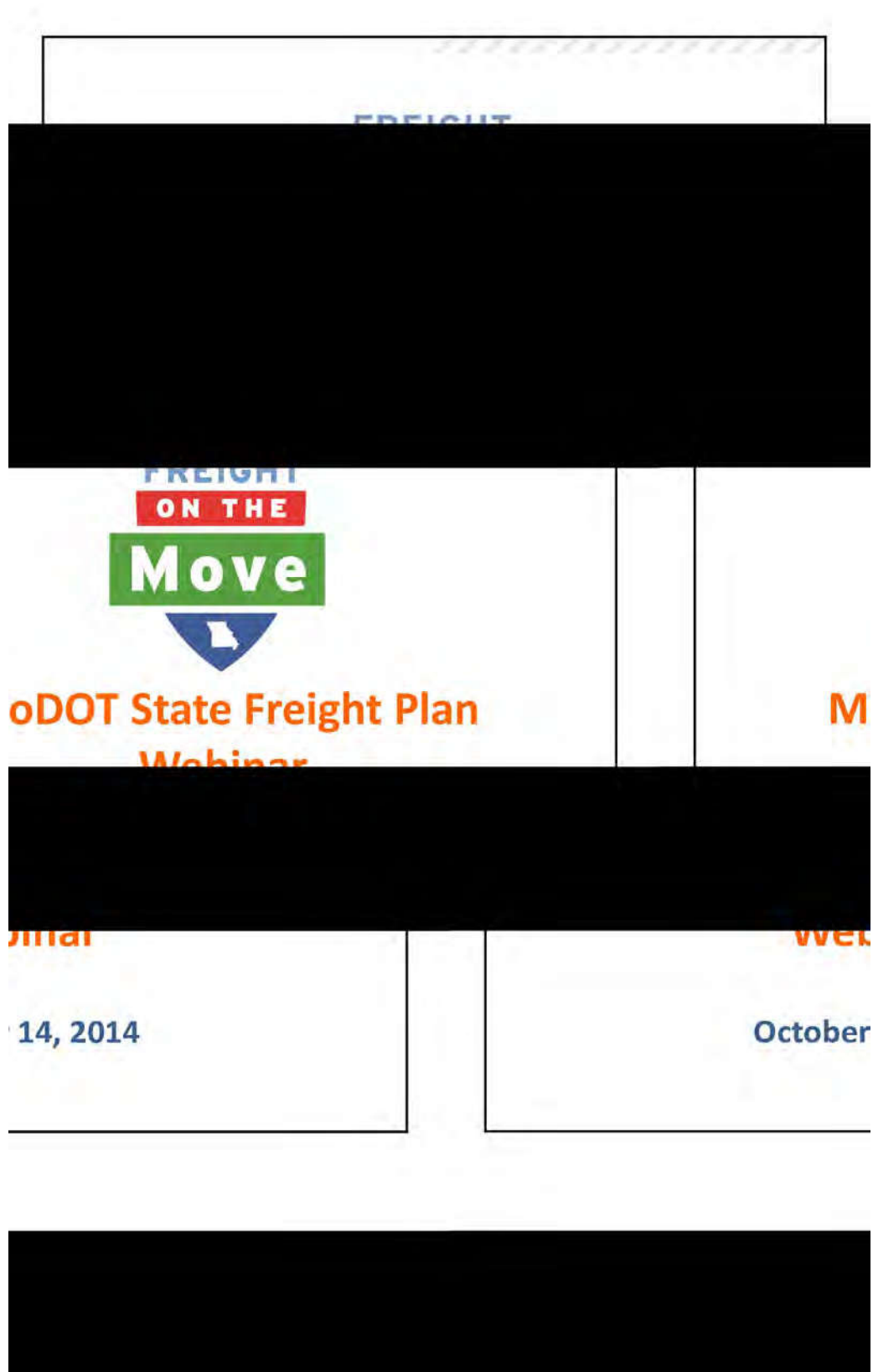
ATTACHMENT 16: Outreach Events

Outreach was conducted at the following organizations during the public comment period. These events included in-person presentations and email communications with organization members to encourage review of the draft plan.

- Boonslick Regional Planning Commission
- East-West Gateway Council of Governments
- Greater Kansas City Chamber of Commerce
- Hannibal Area Chamber of Commerce
- Joplin Diplomats
- Kaysinger Basin Regional Planning Commission
- Lake of the Ozarks Council of Local Governments Regional Planning Commission
- Meramec Regional Planning Commission
- Mid-Missouri Regional Planning Commission
- Mid-America Regional Council
- Missouri Chamber of Commerce
- Missouri Dump Truck Association Board
- Missouri Farm Bureau
- Missouri Chapter of Association of American Railroads
- Missouri Trucking Association
- Neosho Area Business and Industrial Foundation
- Northwest Missouri Regional Council of Governments
- Ozark Foothills Regional Planning Commission
- Pioneer Trail Regional Planning Commission
- Poplar Bluff Chamber of Commerce
- Port Working Groups
- Springfield Motor Carriers
- St. Louis Chamber of Commerce
- Taney County TAC Board
- St. Louis Transportation Club

Appendix D - Stakeholder Outreach

ATTACHMENT 17: Webinar Presentation





Results

- **Inventory of Freight Assets & Assessment of Needs** –acquired TranSearch and ATRI data not previously used
- **Defined Statewide Freight Network**
- **Prioritization Process** – can be used moving forward
- **Prioritized Project List**
- **Competitiveness Measures** – Tracker 7d
- **Action Plan and Implementation Strategies**



Freight Assets & Assessment of Needs



Why was it created?

- To know what assets the State has and their condition

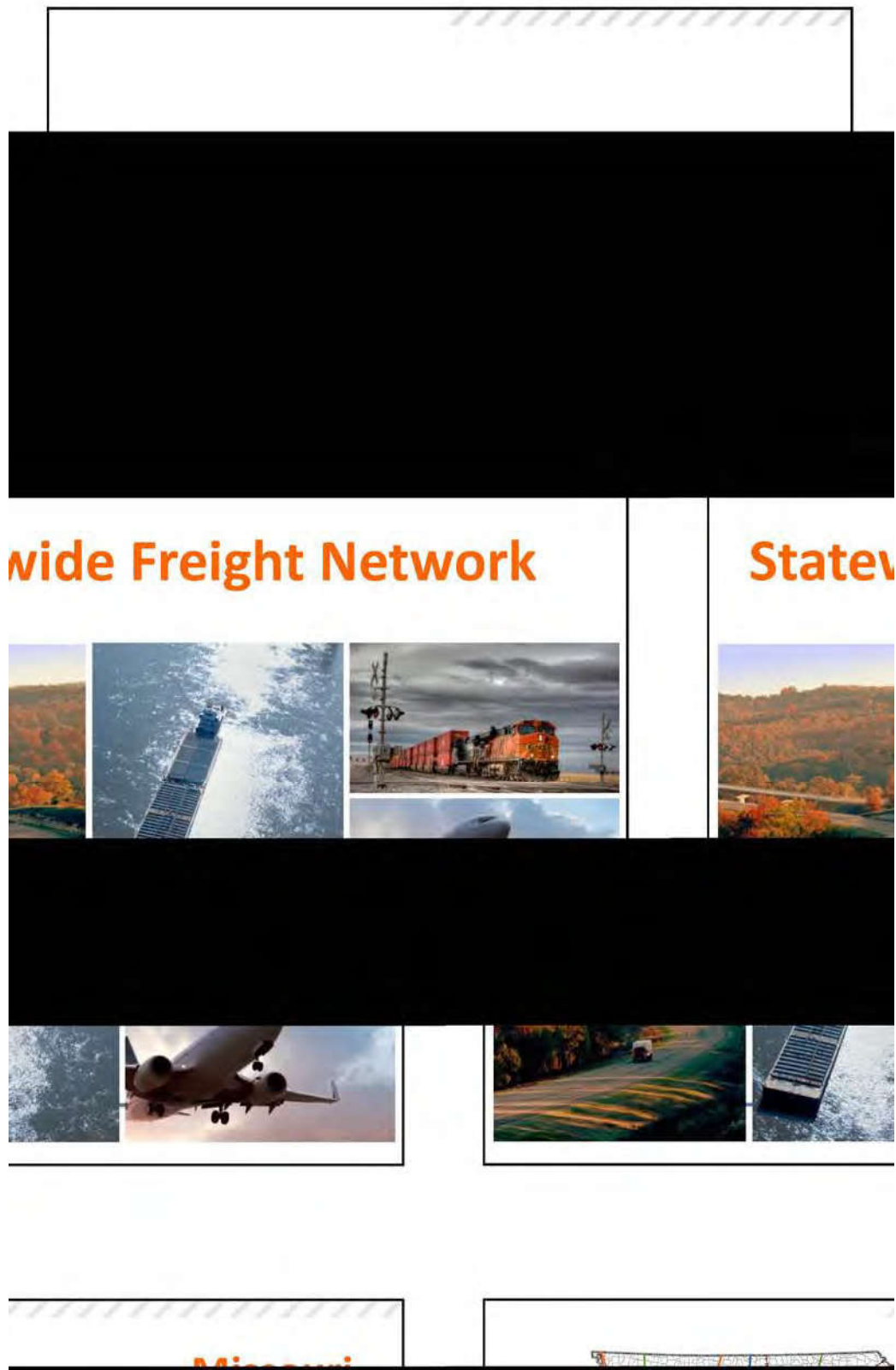
How was it created?

- Asked key stakeholders what we assets we have currently, what condition they are in, and what the state needs to do to be competitive
- Reviewed reports and up to date freight data

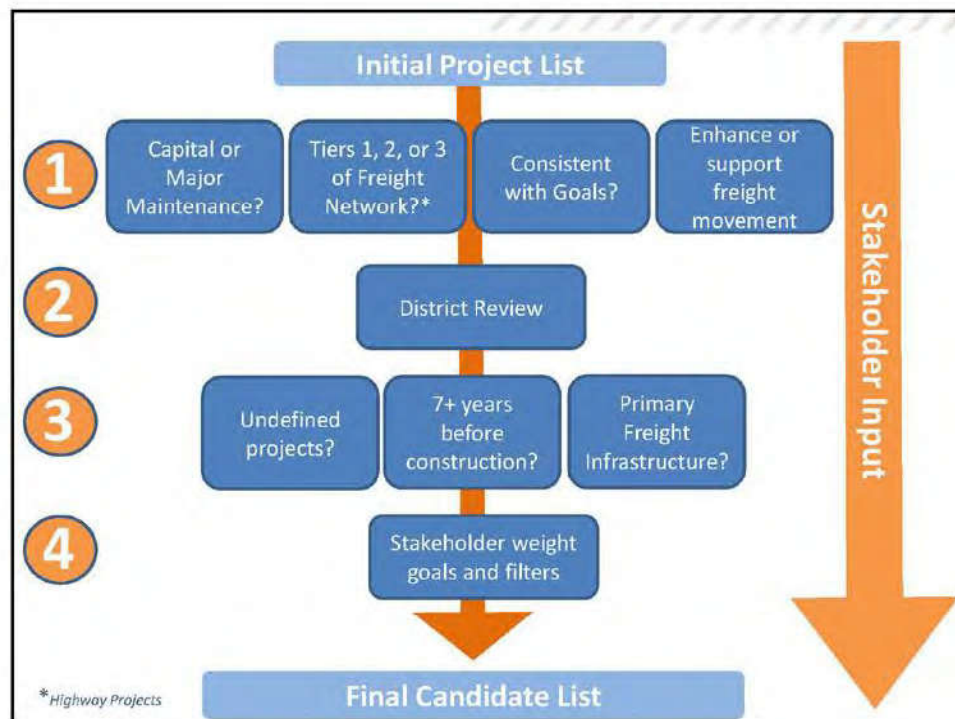
What resulted?

- State Freight Network Map





Project Prioritization Process



Performance Measures & Metrics



Built on Strong Foundation of Tracker

Freight Plan Goal	Recommended Measures
Maintenance Maintain the freight system in good condition	<ul style="list-style-type: none"> Percent of the major highways in good condition* Percent of structurally deficient deck area on National Highway System bridges*
Safety Improve safety on the freight system	<ul style="list-style-type: none"> Number of commercial vehicle crashes resulting in fatalities or serious injuries* Rail crossing crashes or fatalities*
Economy Support economic growth and competitiveness	<ul style="list-style-type: none"> Goods movement competitiveness* Job and economic growth by key sector, including: <ul style="list-style-type: none"> Agriculture Manufacturing Transportation/Logistics
Connectivity and Mobility Improve the connectivity and mobility of the freight system	<ul style="list-style-type: none"> Freight tonnage by mode* Annual hours of truck delay* Truck reliability index*

* These or similar measures have been established in MoDOT's Tracker

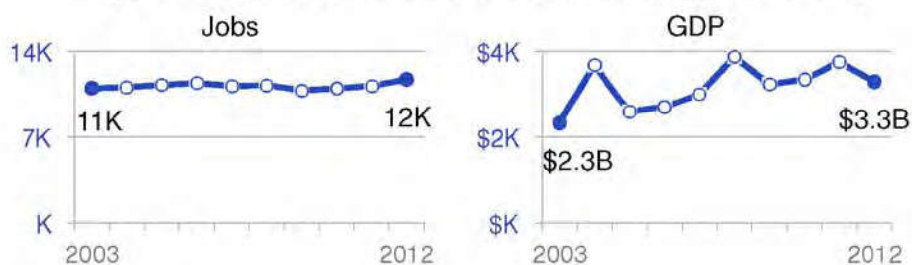
Competiveness Metric – Soybeans to New Orleans by barge

Cost of Shipping One Ton of Soybeans to New Orleans
(largely by barge)



Economic Growth in Key Sectors – Agriculture

Figure 11: Jobs and Economic Growth in the Agriculture Industry

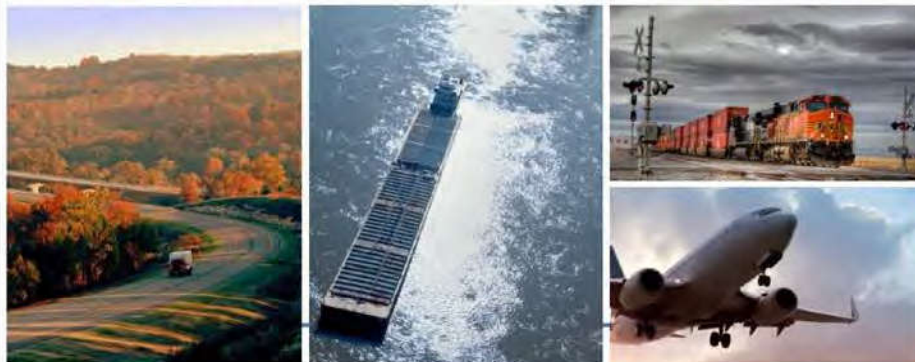


Performance Highlight: Truck Delay and Reliability Index

Figure 15: Hours of Truck Delay and Truck Reliability Index



Action Plan and Implementation Strategies



- 1** Maintain & improve the freight network
- 2** Use prioritization framework to assist decision-makers
- 3** Expand collaboration with state DED and others

PROGRAM RECOMMENDATIONS

- 4** Develop supportive freight and land use guidance
- 5** Increase public awareness about freight

- 6** Continue engaging statewide eco-devo partners
- 7** Host annual freight roundtable
- 8** Consider developing a rail public-private partnership

PROGRAM RECOMMENDATIONS

- 9** Identify and preserve critical multi-modal nodes
- 10** Partner with others involved in certified site programs

Appendix D - Stakeholder Outreach

STRATEGY: INVEST IN FREIGHT INFRASTRUCTURE TO DRIVE LONG-TERM JOB CREATION

Implementation Tactics	Timeframe
Work with MDED/Missouri Partnership to support the Missouri Certified Sites program	Short-term
Leverage private sector investment to gain political support for investment in non-traditional project types.	Short-term
Explore utilizing a rail bank to preserve rail corridors for future needs	Short-term
Continue to explore the use of Private Activity Bonds (PAB) to improve multimodal connectivity facilities	Short-term
Study programs like "In Lieu Fee" for their ability to encourage short-line investment	Short-term
Monitor neighboring states truck licensing fees to limit leakage from what little state multimodal funding is available	Short-term

STRATEGY: INVEST IN FREIGHT INFRASTRUCTURE TO DRIVE LONG-TERM JOB CREATION

Implementation Tactics	Timeframe
Ensure planning and project selection processes considers rural accessibility/just in time performance	Intermediate
Streamline and work to reinstate the Rapid Response Cost-Share program	Intermediate
Study the feasibility of alternative funding sources for future needs	Intermediate
Create statewide programmatic freight selection process and work with districts to supplement district processes	Long-Term
Continue to advocate for dedicated revenue for multi-modal investment	Long-Term

Freight Advisory Committee



Freight Advisory Committee

- Representatives from:
 - Public sector
 - Private companies
 - Elected or appointed officials?
 - OTHERS?
- Regional or Statewide?
- Interaction with Planning Partners?
- Defining the committee's role?



[illegible]

Your input is valuable to the development of the State Freight Plan.

Continue to stay involved:

- **MoFreightPlan.org**
 - Webinar
 - Surveys/comments
- **Contact Cheryl Ball, Freight and Waterways Administrator-Cheryl.Ball@modot.mo.gov**



Appendix D - Stakeholder Outreach

ATTACHMENT 18: Draft Plan Comments

Stakeholders provided the following comments which were considered in finalizing the State Freight Plan.

Edits/Revisions:

- [The executive summary] *misspelled bottleneck on page 12 and left "St." off of St. Joseph on [the] freight network map [on] page 30.*
- [On page 20 of the executive summary,] *instead of "program to improve," [I] suggest "program to support". Instead of using "CI 3," call them "regional railroads." It will make more sense to readers.*
- [On page 26 of the executive summary,] *change "invest in freight infrastructure" to "invest." Would it take a CA or a statute to allow [more] flexibility in funding for Missouri to invest in railroad too?*
- [On page 26 of the executive summary,] *enhance the resiliency of the freight system. [There is a] need for maintaining the flexibility of freight system as a short-term complex environment. Freight supply moves quickly, we have to be able to adapt. It appeared here [that] they were discussing keeping ability to make project investments in short-term flexible, instead of programming and tying up funds for years in the future.*
- [In] *chapters 3 to 12, [the] yellow dots are port to truck to rail. Ports are not on [the] intermodal map, and neither are railroads.*
- [On chapter 3-4,] *Amtrak doesn't own any track. [You] need to change sentences to reference owning the track and Amtrak using the track.*
- [On chapter 5-12,] *second bullet, short lines are already. NW - this appears that they are being removed now. I suggest [changing] to were removed adversely affecting economic development.*
- *Last bullet, [chapter 5-11], where is it? First bullet - a little explanation of why; weave trespassers in, please. Third bullet - why [is] only Howard-Cooper called out? Several ports are looking for access. [I] suggest stating "ports" or naming all [of them]. Fourth bullet - "merchants" needs moved up on the list. It is a top three issue. Mention that it is an issue of national freight importance, not just Missouri freight.*
- [On chapter] *7-3, CI. 1 are regulated heavily on [the] federal level by [Surface Transportation Board] and others. The sentence, as worded, leaves [an] impression that no one regulates them. Please modify.*
- [On chapter] *7-6, railroad expense fund says it is PSC, but this goes to MoDOT now.*
- [On chapter] *9-6, change "challenge" to "challenge/opportunity" in bullet seven.*
- *The "Bottleneck" of Belt Highway 169 from US 36 to I-29 seems odd (wrong). This is a five-lane road intending to give access to business. What information led to us saying this is a bottleneck? What the northwest district has identified is improvements to the I-29 and US 169 interchange on the south connection (Love's Truck Stop). Maybe the Table 9-5 Route should be changed to I-29 and US 169 south and leave the "To/From" blank. That would add some clarity. The interchange ramps were in the CA7 proposed project list. We've taken the stance that this project may need to be on hold until such time as the bridges deteriorate significantly. While the interchange is not ideal, an improved interchange is difficult to justify.*
- [Chapter 4-10 uses the] *wrong Union Pacific Line.*
- [I] *would like to see chapter [7-5 and 7-6] include some information on funding sources for the modes. I believe that is directed at 7-2 and 7-3, and somewhere in the plan a little about who pays for maintenance of each type of asset once constructed.*
- [I suggest] *adding tracker measure impacts to prioritization process.*

Railroad Specific:

- [Page six of the executive summary should] *list some commodities [such as] auto and intermodal. [It would be helpful to] weave some of the Association of American Railroads website information on the intrastate too. [The] goal [should include helping] people understand that rail is more than coal moving. It is containers of many goods.*
- [On page 19 of the executive summary,] *land use is important to railroad. [It would be helpful if] a safety message about keeping people separate from the rail lines [could be added].*
- *The railroad [is] asking us to keep in mind that projects need to be looked at both regionally and statewide.*
- [The] *railroad would like [a] small group of contacts for project discussion. [and] would prefer it to be Eric, Cheryl and Michelle, not each district. The method use for [the] CA7 project was too complex and a drain on their resources. We are a small part of their multi-state responsibility, so having them participate in multiple meetings within seven regions of our state, is a drain. In addition, they agree that the regional project selections work well for moving things within that region. However, [they] request statewide or multi-state evaluation of the freight system and projects to support it.*
- *The railroad would like to be a one stop shop for issues at MoDOT with staff who are experienced and understand the many issues [that are] on-going.*

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- *FAC would like each of the CIs to have a seat at the table, or at least be invited for [the southwest] group. They will only have a handful of potential projects overall.*
- *[The State] need to make sure that the rail industry is covered and that the Plan considers improvements to the rail system.*
- *Springfield has two major rail yards and four intersecting major highway arterials with relatively litter urban sprawl to impede the flow of freight. With the limits and problems associated with maritime freight, why is Springfield not considered for a major freight hub? Also, future fuel prices and truck versus rail fuel cost should be more central to the discussion.*
- *MoDOT reminding everybody of the instrumental role it played in construction of the Sheffield Flyover and Argentine Connection here in the Kansas City [is a positive]. Add to that the improvements that MoDOT has facilitated on the Union Pacific corridor between Kansas City and Chicago in the name of improving on-time performance of Amtrak's Missouri River Runner and laying the groundwork for both faster service and additional frequencies. The latter improvements have significant benefits for freight traffic on [Union Pacific].*
- *I have always thought the rail line between St. Genevieve and Bismarck needs to be brought up to standard. Although Union Pacific is uninterested in their own property, this line is of great economic importance to the communities that are located along it. Also, with the new frac sand mine located in St. Genevieve County, the railroad would not allow that industry to use the rail, which in turn causes more truck traffic to be on the roads between St. Genevieve and Bismarck, Missouri, where the material is loaded on rail. I feel a short line railroad would be the best answer to this rail corridor.*

Highways/Roadways:

- *[In terms of] showing Missouri military installations as freight stakeholders in their Statewide Freight Plan, it is understood that there may be times when the military does not want to share information on their movements, but they should cooperate with MoDOT on the types of vehicles that use [The Strategic Highway Network] and other roads with the National Network.*
- *Embedded in the Plan are some of the MAP-21 directives (truck parking and the use of performance measures, but [I] did not see how this Plan connects with oversize and overweight vehicle regulations (23CFR 657 and 658). As you know, MoDOT is responsible for submitting a State Enforcement Plan (SEP) and Certification (Governor signed) each year. Recognition of the SEP/Certification and how recommendations from the SEP/Certification should be linked to the SFP.*
- *[There are] too many through-traffic trucks on state-lettered highways. Could the not be designated to state numbered highways only? The lettered highways were never designed or built to sustain such loads or speed limits, as many were constructed in the 30s, 40s and 50s.*
- *We need to look at an alternate to trucks, such as rails, and see if this is cost effective. I live in a town where there were rail lines and they took them up. We could use those now to help transport goods and keep truck traffic down. Also, look at increasing truck traffic at night and decreasing it during the day, and perhaps banning it altogether on a Sunday, such as in Europe. We need to look at ways rural areas could contribute to the freight program, [such as] offering parking areas, truck stops and mechanic shops.*
- *I did not really see anything about how interstate traffic would be improved, [such as] no Sunday truck traffic, designated truck lane, increased night driving [or] decreased day driving.*
- *Big trucks on the interstate system are apparently without much regulation. Missouri citizens are at risk every time they are on Missouri roads [due to] incompetent, impaired big truck drivers [who are] almost all from out-of-state. Yet, the money spent on the electronic warning signs on the interstate are used to chastise passenger vehicles to stay out of the way of trucks [and to] give them plenty of room. All the while, you cannot drive 100 miles on I-70 or I-44 without being run off the road or threatened by an 18-wheeler. These out-of-state trucks kill our citizens, then are given a traffic ticket and climb back in their trucks. Why is Missouri the only state between here and the Atlantic Ocean that does not have reduced speeds for big trucks? Why do we not have signs up telling trucks they will be ticketed, if they drive up hills [for] 35 miles side-by-side, blocking all lanes? This is not permitted in other states, but is in Missouri, why?*
- *[There needs to be] more [of an] emphasis on truck freight paying tolls and paying more in highway diesel taxes. Pedestrians, bicyclists and public transit has been neglected far too long in favor of roads for trucks paid for by passenger vehicles. [Since] trucks are responsible for the majority of damage to roads, there needs to be a use fee.*
- *Freight affects everyday life in that it adds to traffic congestion on the interstates and damages roads.*
- *If I am driving 70 miles per hour on I-70, I am constantly passed by trucks. Do they have to abide by the speed limit or not?*
- *MoDOT should continue to focus on improving the highway system and coordinating between freight providers and local governments to provide for multimodal connections.*
- *Freight movement in southeast Missouri relies heavily on Interstate 55, Interstate 57, Route 60, Route 67 and Route 412. Truck traffic accounts for 45% of the traffic volumes on I-55, south of Route 60. We, in Missouri, need to understand the freight movement and traffic patterns in adjacent states.*

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- *In Arkansas, the I-40 between Memphis and Little Rock is operating with truck volumes over 50%. Improving the interstate corridors in Missouri, such as US 67 and US 412, will help provide relief to I-40.*
- *In Kentucky, the US 51 Bridge over the Ohio River between Cairo, Illinois, and Wickliffe, Kentucky, was opened to traffic as a toll facility on November 11, 1936. The 76-year-old structure is officially termed "functionally obsolete" because it does not meet current traffic standards. The US 62 Bridge over the Mississippi River between Wyatt, Missouri and Cairo, Illinois was built in the same time period and is "functionally obsolete," as well. A new bridge is being planned over the Ohio River by the Kentucky Transportation Cabinet. The location will be critical to freight movement in Missouri.*
- *The current plan to replace the Ohio River Bridge between Cairo, Illinois, and Wickliffe, Kentucky, at its current location seems to not solve this problem. It appears that a better plan would be to build a four-lane bridge north of Cairo, connecting to US 60 in Kentucky with a four-lane road from Kevil to Barlow and continuing to a new bridge over the Ohio River, connecting to I-57 north of Cairo. This would allow four-lane traffic all the way across the southern part of Missouri going west, connecting with the interstate highway system at Springfield, Missouri and east to Paducah, Kentucky and further east to Nashville, Tennessee via I-24 or continuing east through Kentucky to other eastern areas via four-lane roads. This bridge issue currently involves the states of Kentucky and Illinois, since this is where the bridge will connect, but this will affect traffic in Missouri.*
- *Currently, there are only two crossings of the Mississippi River, at St. Louis and Memphis, for freight traffic to go both east and west via four-lane roads or interstate highways. Traffic coming out of southern Illinois, southern Indiana and Kentucky has no easy access going west, while southern Missouri cannot go east without either going north to St. Louis, or south to Memphis. Both of these options incur additional time and costs to truckers.*

Waterways and Ports:

- *It's important to educate others about the Missouri River and to strive to have it taken off the list of low-use waterways. I overheard a conversation the other day that a representative from the Oklahoma Department of Transportation was meeting Kansas Corn Growers, the Wheat Association and also soybean farmers to express to them the importance of the Arkansas River. I think we need to reach out to our neighbors to the north and west and let them know that the Missouri River is navigable up to Sioux City, and that between Sioux City and New Orleans, we have only one lock and dam. That equates to 1,877 miles of river with only one area of potential problems, when people are looking at deteriorating infrastructure and delays due to closure.*
- *[I] desire to see maritime freight more prominently referenced within the plan.*
- *We provide transportation opportunities for our customers by using the Missouri River. We can tap into the global marketing by using the Missouri River. There is a lot of freight moving on the river [that] most people do not know about. Your study only shows public ports, which portrays [that] nothing is going on in [the] Missouri River. There [are] ways to work with private terminals to gain benefit to the State of Missouri. We move over 100 loads up the Missouri River to various locations all the way to Sioux City. Please include this movement in your study.*

Graphics/Aesthetics:

- *[The] comments were focused on moving forward and how we collaborate and try to develop mutually beneficial data sources. [Stakeholders] gave big kudos to the [executive summary]. [The stakeholders commented that] it was graphically appealing and very easy to read. They asked how we incorporated new technology into our goals and strategies. They [also] asked how we will use rec#9 to add to [the] freight map or to do a SWOT analysis on the identified network.*

General Suggestions/Questions:

- *[It] seems like a project list appears and then is vetted for prioritization and then passed through to respected planning processes. Goals and performance measures were identified, but what came first, the project or the project born from a systematic process to come up with the project?*
- *What sector is driving the Missouri economy? [I'm] not certain that [the Department of Economic Development] understands how important rail industry is to attracting targeted industries. [I] would like [the] freight plan [executive summary] to help convey [the] message that rail access is important to the [manufacturing] industries.*
- *[I have a] generally positive response. [My] only concern [is] centered around private industry participation.*
- *Consider doing the regional freight groups similar to how [the] blueprint has divided regions, [as well as] developing [a] freight advisory.*
- *[One group at a presentation] asked how much cargo was moved [through] Columbia Regional Airport and what their ranking [is] nationally.*
- *[The] Civic Council offered help in coordinating [the] regional priorities discussion with their business leader members around freight.*
- *There is a need for North [and] South connections out of the State. Also, the state should be planning to take advantage of the Panama Canal connection.*

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- [I am] *disappointed* [that] *this plan is still modal focused and MoDOT didn't set out a transportation direction for the State, instead of continuing to look at regional priorities.*
- [I] *hate the Tennessee [railroad] program. [but I] like their gas tax exemption. [I] suggest we add the Oregon model, where [the] first and last mile improvements have a recapture rate on the moves on that line, where the industry pays back to the expenses. [I] would like to see that mentioned in our plan.*
- [I suggest adding information regarding] *truck ferries.*
- *If there is a way to better call out the locations of the intermodal Facilities in St. Louis and Kansas City, that might help the reader.*
- *I know the methodology for Freight Generators is called out earlier in the document, but with ample free space on [chapter 3-13], perhaps a reminder as to how Freight Generators were determined, methodology, etc. [may be helpful].*
- *The expansion of the Panama Canal is expected to lead to growth in freight movements in Missouri. This growth will result in increasing demands on the highways, rail lines, port facilities and airports handling cargo. Page 11 later contradicts the statement. "...the timing and scale of the [Canal] impacts on Missouri freight flows are unknown." Do we know this to be certain? From what we continue to read [and] hear, the impacts of the Canal are still to be determined.*
- *There are two bridges across the Mississippi River in St. Louis and both are in poor to very poor condition. So, while there is redundancy in the system, the condition of the bridges presents a problem. The condition of these bridges needs to be improved. It is EWG's understanding that the [Terminal Rail Road Association] (TRRA) considers these bridges to be under-capacity and efforts are already underway to improve their conditions/capacity. I think the language on the condition of these rail bridges needs to change, unless TRRA has said differently.*
- *Ensure that bicycle and pedestrian accommodations are included in the purpose and need of future grade separations and crossings intermediate. This timeframe should be short-term. All modes, at all stages of the planning process, should be accommodated for, if possible.*

Miscellaneous:

- [There] *need[s] [to be] more [of a] focus on water and air.*
- *Heck of a good job on the freight plan website. Kudos to all of you!*
- [I] *liked that we had [a] prioritization process [that] they could use as [a] starting point for regional discussion*
- *Water is [essential to] life. We need it for everything. [I] have always thought that Missouri should put in dams and locks on the Missouri River. [I] don't want to end up like California.*
- *Selling this vision to the public, so as to build support, might be useful, but probably hard to do without spending a lot of advertising dollars.*
- *The Plan missed. In a 30 year timeframe, there will be intense demand for infrastructure capable of accommodating autonomous and semi-autonomous trucks. This will impose a huge financial burden, but [will] be essential to Missouri's economic competitiveness. We need to begin doing two things: preserving right-of-way, where likely to be required, and work with private interests on politically practical methods of funding the requisite assets as required over time.*
- *Develop study groups that keep updated on all funding, such as TIGER Grants and innovative ways to use the Grants on our waterways.*
- *Dig deep and often. Mine every scrap of funding that can be used by Missouri.*
- *MoDOT missed incentives to keep freight carriers in Missouri. [These incentives include] cheaper longer-term licensing for vehicles [and] lower tax rates for carriers.*
- *All freight at some point [must] be moved by trucks. Major roads must be maintained.*
- *The public needs to choose what they are paying for, [and] then they will be more apt to support it. The online "Wish List" is a good approach, and should be used continuously, but needs to be fine-tuned.*
- [MoDOT] *needs to look at how to develop driving jobs. With the shortage that is looming in the future, it could be a real problem to move freight.*
- *MoDOT acknowledging Missouri's potential for playing an expanded role in national freight movement [is a positive].*
- *Commendable work. Priorities, for the most part, are correctly placed on maintaining the system and collaboration.*
- *Direct funding for freight modes, where not required, may be both costly for the taxpayers and deleterious for general efficiency of the State's freight movement.*
- *Our highways are overcrowded with trucks and much of our rail infrastructure is decaying.*
- *Amtrak service to Springfield would be a nice addition. Although not freight, it would provide an alternative to the overcrowded passage on I-44.*
- [There are] *too many trucks [and] too few interstates.*
- *Travel [is dangerous] with so much truck traffic.*

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- *We need to get back to railroads. [They are] much more efficient.*
- [I] want to maintain exemption under the design/build by Missouri statute.

Appendix E: Goals and Performance Measures

This technical memorandum outlines the goals of MoDOT State Freight Transportation Plan and the performance metrics that will be used to develop the plan and support its implementation.

Introduction

The Missouri State Freight Plan goals and performance measures will establish the strategic foundation upon which the Plan can be built and implemented.

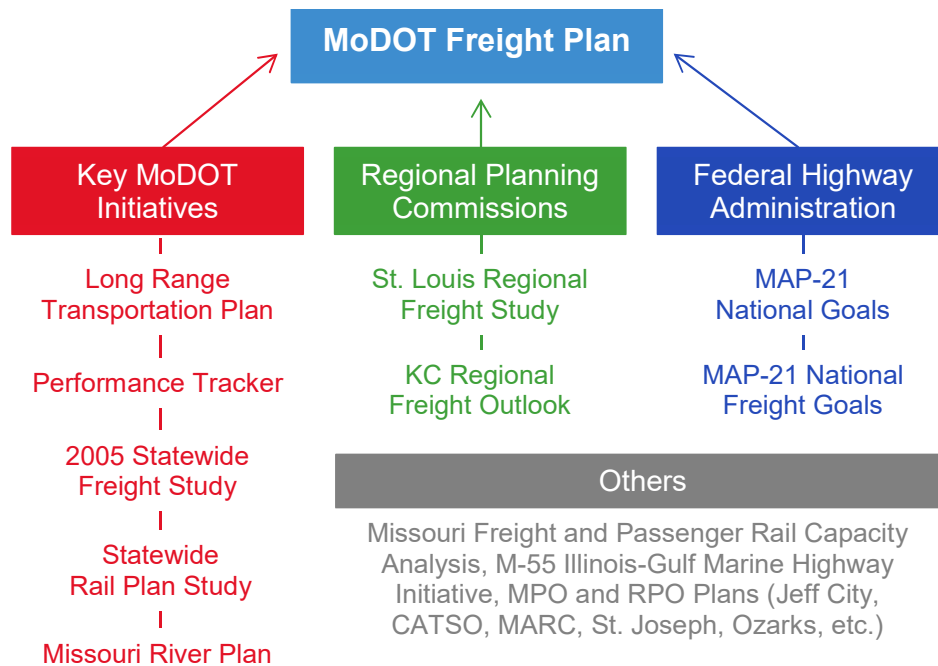
- A broad range of considerations was taken into account when establishing the goals and measures. These considerations are detailed in this appendix, and include a variety of MoDOT efforts as well as initiatives led by its partners such as FHWA and the regional planning partners in Kansas City (MARC) and St. Louis (East West Gateway).
- The goal areas for the plan, which are detailed in in this appendix, align with those established during MoDOT's extensive public engagement effort On the Move and the subsequent 2013 Long Transportation Range Plan. They are:
 - Maintenance
 - Safety
 - Economy
 - Connectivity
- For each of these goal areas, a strategically selected set of performance measures will be used to craft and implement the Freight Plan. These measures, which are introduced in in this appendix, are built on MoDOT's strong record of performance management, best illustrated by *Tracker* - the Department's well known quarterly performance measurement publication.
- Also in this appendix is an outline of how the goals and performance measures might be integrated with the remaining components of the Freight Plan and the next steps necessary to do so.

Considerations

Freight infrastructure investment decisions in Missouri are influenced by a broad range of considerations, including MoDOT's strategic direction and system plans and the needs and activities of MoDOT's partners in the delivery of freight infrastructure. As such, it is important that the State Freight Plan not stand alone but instead align and be informed by the national, state, and local plans and policies that already exist or are in development. **Figure E-11** illustrates these considerations and is followed by a brief summary of each initiative.

Appendix E – Goals and Performance Measures

Figure E-1: Considerations into the MoDOT State Freight Plan Goals



Key MoDOT Initiatives

MoDOT Long Range Transportation Plan

The 2014 Long Range Transportation Plan (LRTP), titled *A Vision for Missouri's Transportation Future*, included the extensive *On the Move* public and stakeholder outreach effort. This outreach effort, coupled with a technical needs analysis, laid the groundwork for the establishment of four goals for meeting Missourians' expectations for their transportation system, including:

- Take Care of the Transportation System and Service We Enjoy Today
- Keep All Travelers Safe, No Matter the Mode of Transportation
- Invest in Projects that Spur Economic Growth and Create Jobs
- Give Missourians Better Transportation Choices

Tracker

MoDOT's *Tracker* is a quarterly publication of departmental performance measures that documents MoDOT's progress. It includes more than 50 performance measures directly linked to the department's mission, values and priorities. The measures gauge performance in seven "Tangible Results" areas, including:

- Keep Customers and Ourselves Safe
- Keep Roads and Bridges in Good Condition
- Provide Outstanding Customer Service
- Deliver Transportation Solutions of Great Value
- Operate a Reliable Transportation System
- Use Resources Wisely
- Advance Economic Development

Appendix E – Goals and Performance Measures

Many of the performance measures contained in the Tracker are directly related to the movement of freight and provide a foundation for establishing measures for the Freight Plan.

Statewide Freight Study

MoDOT undertook the Missouri Statewide Freight Study in 2005 as a precursor to an update of a previous LRTP. The Study's primary objective was to study the movement of freight through all modes of Missouri's transportation system in an effort to improve efficiency and safety throughout the system. The Study included five goals:

- Improve Freight System Reliability
- Develop Freight Data and Measure Performance
- Strengthen Intermodal Connectors
- Use Technology to Enhance Freight Operations
- Involve Freight Stakeholders in the Process

Missouri Statewide Rail Plan

The Missouri State Rail Plan, completed in May 2012, provides the strategic framework for passenger and freight rail service in Missouri for the next 20 years. It establishes Missouri's rail vision "to provide safe, environmentally-friendly transportation options supporting efficient movement of freight and passengers, while strengthening communities and advancing global competitiveness through intermodal connectivity."

The Plan evaluates the existing conditions and current and future capacity needs of Missouri's railroad system, and sets for the following goals:

- Promote the Efficient Movement of Passengers
- Promote the Efficient Movement of Freight
- Encourage Intermodal Connectivity
- Enhance State and Local Economic Development
- Promote Environmental and Socially Responsible Rail Transportation Development
- Promote Safe and Secure Railroad Operations

Missouri River Plan

The 2011 Missouri River Freight Corridor Assessment and Development Plan outlines the steps needed to redevelop the Missouri River as a freight corridor with reliable service that support a sustainable market and logistics system. The plan sets forth the following "concepts of operations":

- Steps should be taken to realize the potential of returning the traditional market commodities to the River
- Infrastructure and terminal upgrades are needed to handle a potential shift from land transportation mode to the River
- Emerging markets provide an opportunity for growth but will be more challenging to develop
- Advocacy plays an important role in promoting sustainable freight infrastructure
- Guidance for maintaining freight movement when water levels are above or below optimal conditions is critical

Regional and Local Initiatives

St. Louis Regional Freight Study

The St. Louis Regional Freight Study examines the regional freight needs and identifies strategies to anticipate and take advantage of economic opportunities. The study's recommendations include:

- Implement a Regional Freight Transportation District
- Pursue a "Sector Champion" strategy for freight and logistics (similar to that of the plant and life sciences industries)
- Align economic development with supply chains
- Increase freight speeds and railroad network access

Appendix E – Goals and Performance Measures

- Complete a rail network study for the Region, with the active participation of the Class 1 and Short Line Railroads.
- Develop a more robust regional freight Geographic Information System (GIS) supported by performance metrics
- Re-engage with the private sector and pursue public-private strategies to move toward a smaller number of high capacity port terminals
- Emphasize strategies to assemble/reuse older waterfront sites
- Improve monitoring of truck traffic levels on key arterials and near intermodal yards
- Initiate studies to widen the I-270 New Chain of Rocks Bridge to 3-lanes and focus improvements on Hall Street and Route 3 where viable business locations conflict with old infrastructure

Kansas City Regional Freight Outlook

The Mid-America Regional Council (MARC) and Kansas City SmartPort initiated the Kansas City Regional Freight Outlook (RFO) in collaboration with the Kansas and Missouri DOTs in 2009. The RFO was intended to sustain and expand the region's presence in the transportation and logistics industries. The RFO identified the following objectives and critical actions:

- Improve goods movement system performance
- Support transportation and logistics business attraction and retention
- Contribute to ensuring the region's quality environment
- Focus on transportation-related project to identify and highlight freight-related benefits
- Expand the use of existing technologies and tools to monitor freight-specific data
- Recognize the Corridors of Freight Significance - corridors characterized by their service for freight at a National, Regional, or Local level - and conduct regional assessments
- Focus on attraction of transportation and logistics industries
- Improve marketing efforts by emphasizing the competitive advantage of the region

Federal Initiatives

MAP-21 National Goals

The most recent federal surface transportation act, Moving Ahead for Progress in the 21st Century (MAP-21) establishes a performance and outcome-based program and requires states to demonstrate and achieve progress towards seven national goals. The goals are:

- Safety - To achieve significant reduction in traffic fatalities and serious injuries on all public roads
- Infrastructure Condition - To maintain the highway infrastructure asset system in a state of good repair
- Congestion Reduction - To achieve a significant reduction in congestion on the National Highway System
- System Reliability - To improve the efficiency of the surface transportation system
- Freight Movement and Economic Vitality - To improve the national freight network, strengthen the ability of rural communities to access national and international trade markets, and support regional economic development
- Environmental Sustainability - To enhance the performance of the transportation system while protecting and enhancing the natural environment.
- Reduce Project Delivery Delays - To reduce project costs, promote jobs and the economy, and expedite the movement of people and goods by accelerating project completion through elimination delays in the project development and delivery process, including reducing regulatory burdens and improving agencies' work practices

MAP-21 National Freight Goals

Map-21 requires US DOT to develop a National Freight Policy that will include the following goals for the national freight system:

- Economic Competitiveness - Invest in infrastructure improvements and implement operational improvements that strengthen the contribution of the national freight network to the economic competitiveness of the U.S., reduce congestion, and increase productivity
- Safety, Security and Resiliency - Improve the safety, security, and resilience of freight transportation
- State of Good Repair - Improve the state of good repair of the national freight network

Appendix E – Goals and Performance Measures

- **Advanced Technology** – Use advanced technology to improve the safety and efficiency of the national freight network
- **Performance and Accountability** – Incorporate concepts of performance, innovation, competition, and accountability into the operation and maintenance of the national freight network
- **Economic Efficiency** – Improve the economic efficiency of the national freight network
- **Environmental** – Reduce the environmental impacts of freight movement on the national freight network

Other Initiatives

In addition to those described above, several other ancillary plans and initiatives were used to inform the development of the Freight Plan's goals and performance measures. Details about each can be found in Appendix A, including:

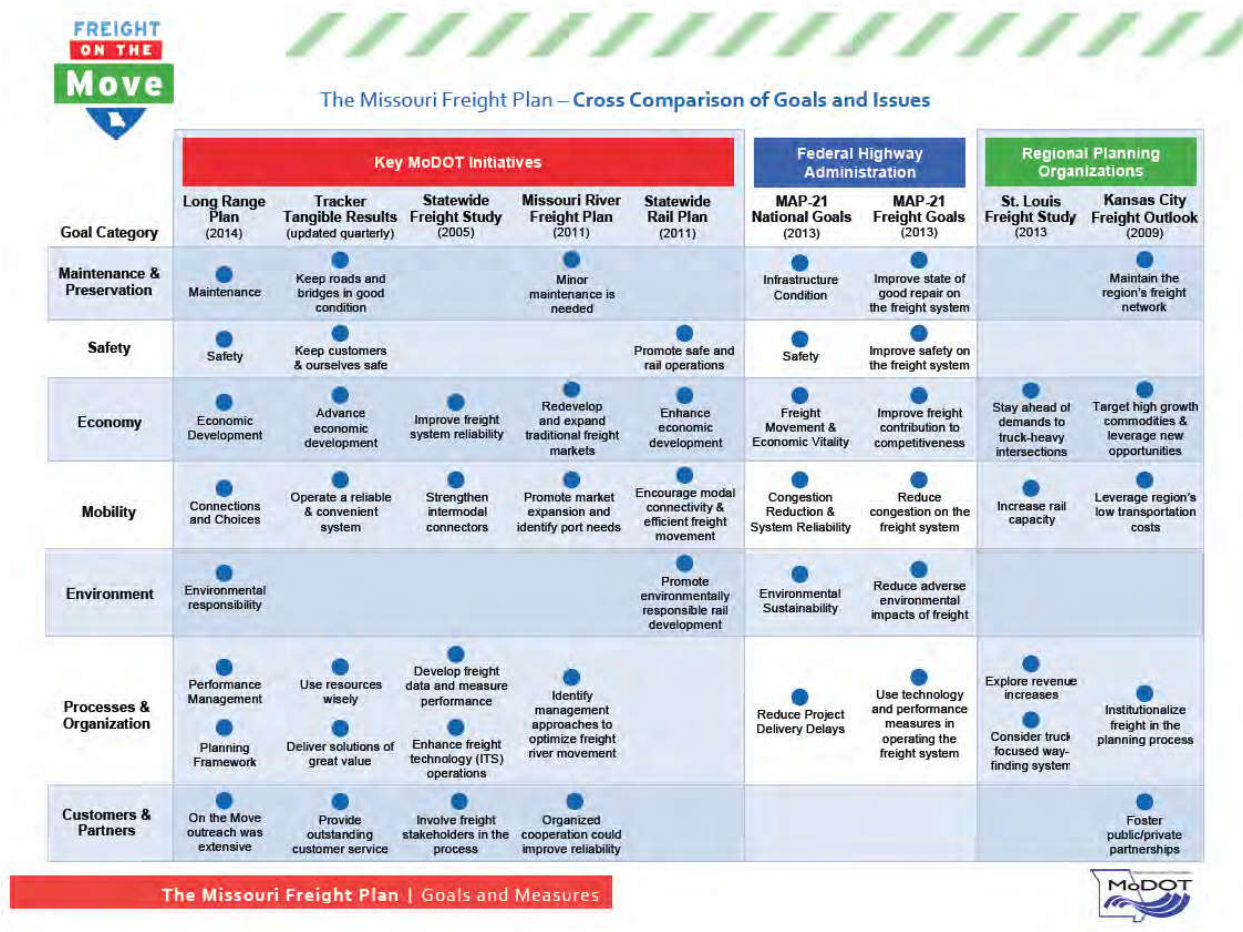
- M-55 Illinois-Gulf Marine Highway Initiative
- Missouri Freight and Passenger Rail Capacity Analysis
- Columbia Area Transportation Study Organization (CATSO) Long Range Transportation Plan
- 2035 Capital Area Metropolitan Planning Organization (CAMPO) Metropolitan Transportation Plan (MTP)
- MARC Long Range Transportation Plan – Transportation Outlook 2040
- Greater St. Joseph Area MPO 2040 MTP
- Ozarks MPO 2035 LRTP

Summary of Inputs

This research has provided a clear and strong foundation from which the Freight Plan goals and performance measures were established. Although these efforts stem from a diverse group of organizations with different intentions and motivations, the majority of the findings can be classified into a handful of what have become industry-standard categories. Figure E-2 illustrates how each of the plans' goals aligns within the categories.

Appendix E – Goals and Performance Measures

Figure E-2: Goals for Key Freight Plan Inputs



Goal Category	Key MoDOT Initiatives					Federal Highway Administration		Regional Planning Organizations	
	Long Range Plan (2014)	Tracker Tangible Results (updated quarterly)	Statewide Freight Study (2005)	Missouri River Freight Plan (2011)	Statewide Rail Plan (2011)	MAP-21 National Goals (2013)	MAP-21 Freight Goals (2013)	St. Louis Freight Study (2013)	Kansas City Freight Outlook (2009)
Maintenance & Preservation	Maintenance	Keep roads and bridges in good condition		Minor maintenance is needed		Infrastructure Condition	Improve state of good repair on the freight system		Maintain the region's freight network
Safety	Safety	Keep customers & ourselves safe			Promote safe and rail operations	Safety	Improve safety on the freight system		
Economy	Economic Development	Advance economic development	Improve freight system reliability	Redevelop and expand traditional freight markets	Enhance economic development	Freight Movement & Economic Vitality	Improve freight contribution to competitiveness	Stay ahead of demands to truck-heavy intersections	Target high growth commodities & leverage new opportunities
Mobility	Connections and Choices	Operate a reliable & convenient system	Strengthen intermodal connectors	Promote market expansion and identify port needs	Encourage modal connectivity & efficient freight movement	Congestion Reduction & System Reliability	Reduce congestion on the freight system	Increase rail capacity	Leverage region's low transportation costs
Environment	Environmental responsibility				Promote environmentally responsible rail development	Environmental Sustainability	Reduce adverse environmental impacts of freight		
Processes & Organization	Performance Management Planning Framework	Use resources wisely Deliver solutions of great value	Develop freight data and measure performance Enhance freight technology (ITS) operations	Identify management approaches to optimize freight river movement		Reduce Project Delivery Delays	Use technology and performance measures in operating the freight system	Explore revenue increases Consider truck focused way-finding system	Institutionalize freight in the planning process
Customers & Partners	On the Move outreach was extensive	Provide outstanding customer service	Involve freight stakeholders in the process	Organized cooperation could improve reliability					Foster public/private partnerships

Recommended Goals

Based on the considerations above and the strategic input of the Steering Committee, four goal areas for the State Freight Plan have been identified. These goal areas reflect what Missourians told MoDOT during *On the Move* and mirror the four goals of the Long Range Plan. They also align well with both MAP-21's national freight policy provisions and with other recent statewide and regional freight studies. MoDOT Freight Plan Goals are:

- **Maintenance** - Maintain the freight system in good condition by keeping highways and bridges in good condition and supporting the maintenance of railways, waterways, airports, and multimodal connections
- **Safety** - Improve safety on the freight system by decreasing the number and severity of crashes involving commercial vehicles and improving safety at railroad crossings.
- **Economy** - Support economic growth and competitiveness in Missouri through strategic improvements to the freight system
- **Connectivity and mobility** - Improve the connectivity and mobility of the freight system by reducing congestion and increasing reliability on the roadways, by supporting improved efficiency of rails, waterways, and airports, and by improving connections between freight modes.

These goals are mostly related to the performance of the freight system itself. In addition to these system-related goals, there are also strategic considerations that are related to the planning process, collaboration with freight stakeholders, and ultimately the implementation of the Freight Plan. These process and program delivery considerations include:

Appendix E – Goals and Performance Measures

- **Environmental** - Reduce and/or mitigate adverse environmental impacts of freight
- **Organizational & Process** - Institute policies and practices that support the freight system, such as exploring funding flexibility and stability and using technology to improve operations on the freight system
- **Customers & Partners** - Improve coordination and collaboration with freight stakeholders

Recommended Performance Measures

Performance measures are used across the transportation industry to assess how transportation systems and agencies are performing. For the Freight Plan, performance measurement can serve the following functions:

- **Plan Development** - Provide a means to quantify baseline system performance and potential Freight Plan recommendations and strategies
- **Plan Implementation** - Support implementation of the Freight Plan, integrating freight performance measures into the budgeting, programming, project selection, and project implementation processes
- **Accountability** - Support accountability for the results of the Freight Plan by tracking and reporting the progress towards the Plan goals (through *Tracker* or some other process).

It is worth noting again that MoDOT has a rich history in performance measurement and management. This is best exemplified by *Tracker*, the department's quarterly performance measure publication. It provides a strong foundation from which to build and many of the recommended measures that follow can be linked directly to *Tracker*.

With *Tracker* as the foundation, and through consultation with the Steering Committee, a limited number of strategic performance measures have been identified within each of the four goals. These measures are summarized in **Figure E-4**.

Figure E-3: Tracker Cover January 2014



Tracker

Appendix E – Goals and Performance Measures

Figure E-4: Recommended Performance Measures

Freight Plan Goal	Recommended Measures
Maintenance Maintain the freight system in good condition	<ul style="list-style-type: none"> • Percent of the major highways in good condition* • Percent of structurally deficient deck area on National Highway System bridges*
Safety Improve safety on the freight system	<ul style="list-style-type: none"> • Number of commercial vehicle crashes resulting in fatalities or serious injuries* • Rail crossing crashes or fatalities*
Economy Support economic growth and competitiveness	<ul style="list-style-type: none"> • Goods movement competitiveness* • Job and economic growth by key sector, including: <ul style="list-style-type: none"> ○ Agriculture ○ Manufacturing ○ Transportation/Logistics
Connectivity and Mobility Improve the connectivity and mobility of the freight system	<ul style="list-style-type: none"> • Freight tonnage by mode* • Annual hours of truck delay* • Truck reliability index*

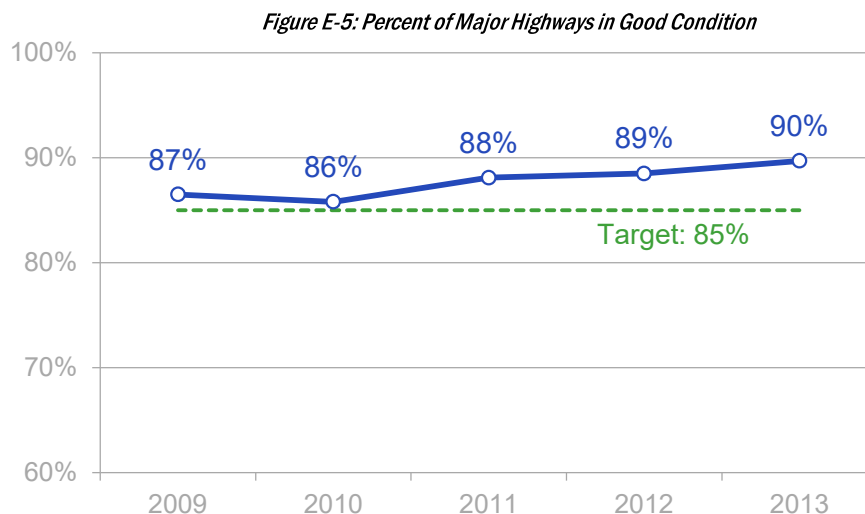
* These or similar measures have been established in MoDOT's Tracker

Appendix E – Goals and Performance Measures

Maintenance Measures

Percent of the major highways in good condition

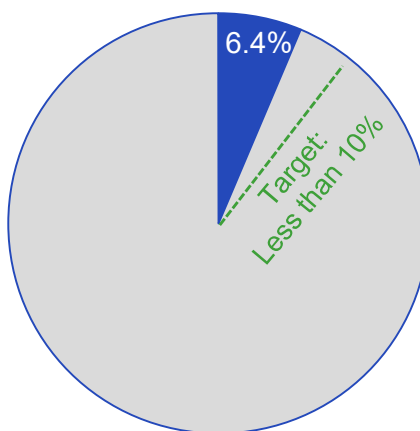
This measure tracks the conditions of Missouri's major highways system, which contains the 5,533 miles of the State's busiest highways including Interstates and most U.S. routes. It also includes busy routes in urban areas, particularly where vehicles travel between business districts and residential areas. **Figure E-5** shows the percent of Missouri's major highways that are in good condition. MoDOT has established a target of better than 85% for this measure.



Percent of structurally deficient deck area on NHS bridges

This measure tracks the percent of structurally deficient deck area for bridges that are part of the National Highway System (NHS). **Figure E-6** shows the percent of structurally deficient deck area on the National Highway System. MAP-21 requires that states track this measure with a target of fewer than 10 percent.

Figure E-6: Percent of Structurally Deficient Deck Area on the National Highway System

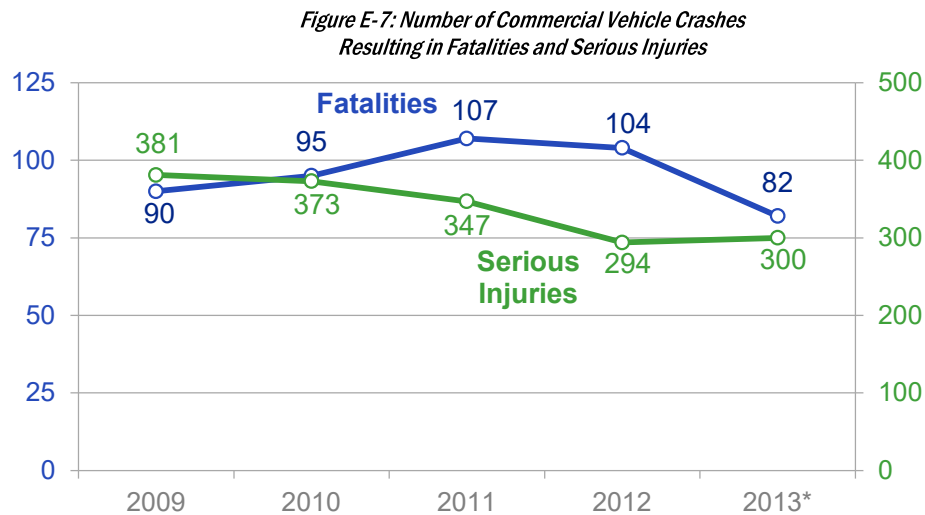


Appendix E – Goals and Performance Measures

Safety Measures

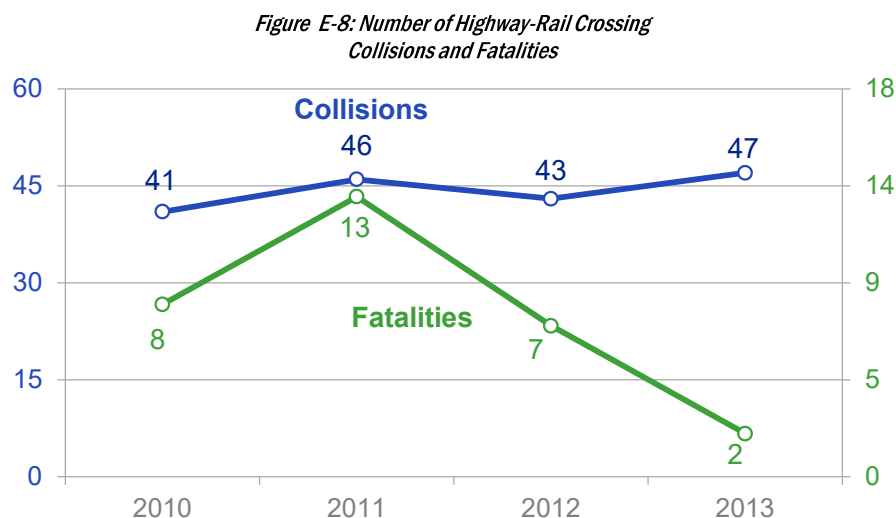
Number of commercial vehicle crashes resulting in fatalities and serious injuries

This measure, as shown in **Figure E-7**, tracks the number of Commercial Motor Vehicles involved in fatal and serious injury crashes each year. MoDOT uses the information to target educational, enforcement and safety improvement feature efforts.



Rail crossing crashes and fatalities

This measure, as shown in **Figure E-8**, tracks annual trends in fatalities and collisions resulting from train-vehicle/pedestrian crashes at public railroad crossings in Missouri. This data drives the development and focus of a portion of the Missouri Highway Safety Plan.



Appendix E – Goals and Performance Measures

Economy Measures

Goods movement competitiveness

This measure, developed specifically as a part of the Freight Plan and shown in Figures E-9, E-10, and E-11 tracks annual trends in the cost of transporting three key commodities in Missouri as compared to other Midwest states. The commodities are soybeans, crop protection, and motor vehicles. There is much more to economic competitiveness than just the costs associated with the three commodities and their specific destination and mode of travel – as such a more comprehensive look at each of can be found in Appendix B.

Figure E-9: Cost of Shipping One Ton of Soybeans from Key States to New Orleans (*largely by barge*), 2014



Figure E-10: Cost of Shipping One Ton of crop protection from Key States to Mexico (*largely by rail*), 2014



Figure E-11: Cost of Shipping One Motor Vehicle from Key States to Toronto (*by truck*) and Los Angeles (*by rail*), 2014



Appendix E – Goals and Performance Measures

Job and economic growth by key sector in Missouri

This measure was also developed specifically as a part of the Freight Plan and was done so in partnership with the Missouri Department of Economic Development. For three key transportation-reliant sectors – agriculture, manufacturing, and transportation/logistics – this measure tracks job and economic growth (GDP) growth and is shown in **Figures E-12, E-13 and E-14**.

Figure E-12: Jobs and Economic Growth in the Agriculture Industry in Missouri

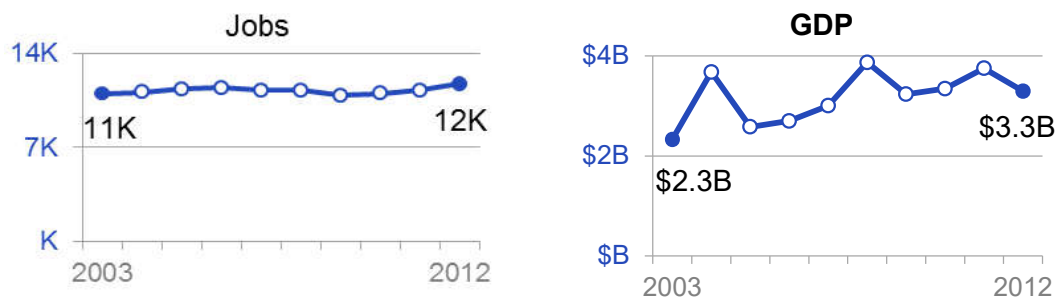


Figure E-13: Jobs and Economic Growth in the Manufacturing Industry in Missouri

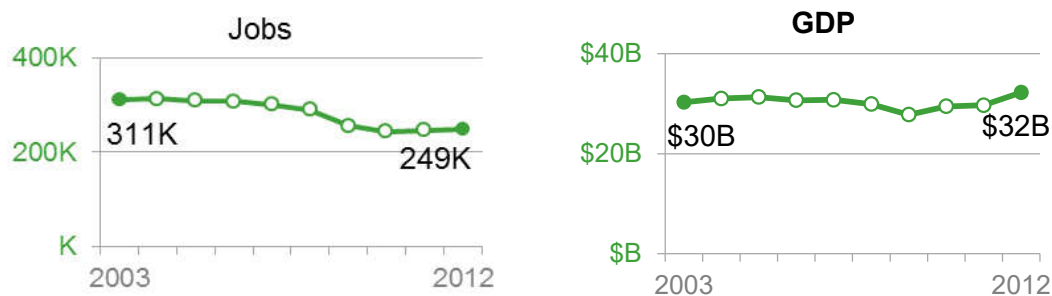
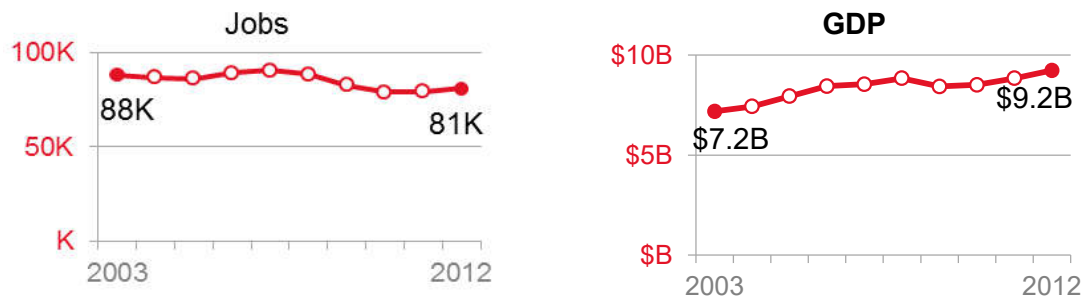


Figure E-14: Jobs and Economic Growth in the Transportation/Logistics Industry in Missouri



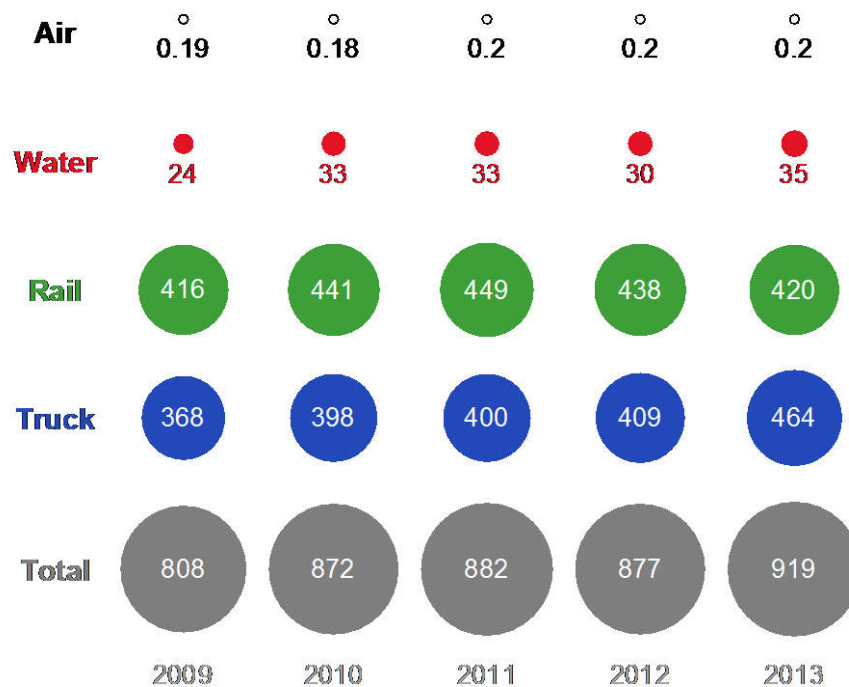
Appendix E – Goals and Performance Measures

Connectivity Measures

Freight tonnage by mode

This measure, shown in **Figure E-15**, tracks the amount of freight moved by Missouri's largest transportation modes. These modes experience volume shifts from year to year, often based on the health of the national economy and shifts in consumer preferences. For example, air has seen slight increases due to increases in e-commerce, water usage has increased as disruptions due to drought and flooding have been less frequent, and rail usage has declined slightly because of less coal usage in the country.

Figure E-15: Freight Tonnage by Mode (millions)



Appendix E – Goals and Performance Measures

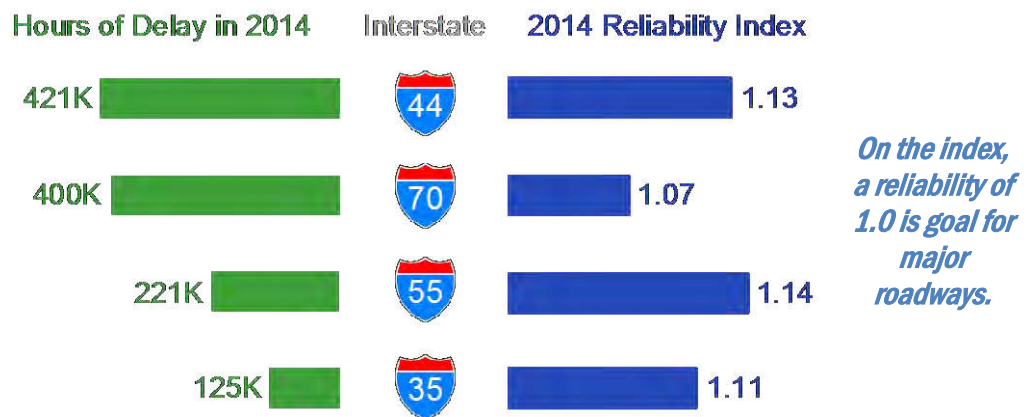
Annual hours of truck delay and truck reliability index

Annual hours of truck delay and truck reliability index are measures proposed for use in MAP-21 to measure national freight performance.

Delay is measured anytime trucks experience speeds 5 mph or more below the posted speed limited. These delays impact the cost of goods and reduce business's ability to complete on a global scale.

The Reliability Index, shown in **Figure E-16**, is a measure of how consistent truck travel times are on a corridor - the closer the index is to 1.0, the more reliable the corridor. Shippers and freight carriers require predictable travel times to control transportation costs and remain competitive.

Figure E-16: Hours of Truck Delay and Truck Reliability Index



Integration Within the State Freight Plan

The goals and performance measures established within this document provide a foundation from which to build the Freight Plan. The following components of the plan that will be informed by these goals and measures:

- Trends and needs analysis – The data and analysis contained within these performance measures should support and enhance the baseline efforts to quantify the trends, issues and needs within the plan development.
- Scenario analysis – As the scenarios are developed and analyzed, the impact upon these performance measures will be estimated.
- Project prioritization – As projects are evaluated for their freight impacts, the performance measures can provide a baseline from which the prioritization criteria can be developed.
- Policy development – As policies and overall Freight Plan recommendations are developed, these goals and performance measures can inform their development by offering a glimpse into where and how the freight system can and should be maintained and/or improved.
- Communication efforts – Performance measures can often be useful in communicating the impact and importance of the freight system. The economic competitiveness metric could be especially useful in this area.
- Plan implementation – After the plan is completed, these performance measures can be incorporated into MoDOT's Tracker to observe how well the recommendations coming out of MoDOT Freight Plan have been implemented.

Appendix F: Scenario Planning

This technical memorandum discusses scenario planning, a visioning tool for the future of Missouri freight and freight planning.

Why scenario planning?

Before one can begin any sort of plan, a future must be defined to plan towards. Traditionally, this has meant looking at past data trends to predict the future. However, this does not work for freight plans. Unlike traditional plans, which are driven by population and job growth, statewide freight growth is largely a function of global trends which are much more volatile and unpredictable. Essentially, a decision made half-way around the world can have a dramatic effect on roadway volumes in rural Missouri.

Scenario planning is an alternative to the traditional planning method, which utilizes global trends to develop various future scenarios that allow MoDOT leaders and freight stakeholders to evaluate and plan for likely futures. Unlike the traditional quantitative methods, this process allows an open dialog that result in more informed decision-making. Namely, it allows planners including stakeholders such as modal and operational experts and public officials to discuss trade-offs, nuances and cause/effect relationships that the traditional methods would not identify. By working through the alternate futures described in each scenario, stakeholders were able to extract common needs that are likely to be relevant no matter what the future may hold.

Appendix F – Scenario Planning

Scenario Development

The project team began this process by identifying probable future trends based on lessons learned during stakeholder outreach, known industry trends and the MoDOT LRTP. **Table F-1** identifies the key trends identified that served as the framework for the development of the future scenarios.

Table F-1: Trends Driving Future Freight Movement in Missouri

Identified Trend	Description
Increase/Reduction in Global Trade	Sustained increases or reductions in global imports and exports
Alternative Fuel Trends	Increases in production and usage of alternative fuel sources
Transportation Network Conditions	Travel time and reliability is severely impeded by poor system conditions
Panama Canal Expansion	Widening of the Panama Canal could dramatically change freight flows
Science and Technology Advances	Advances in science and technology, such as advanced agricultural pesticides or machinery
Aging of the Missouri Population	Average life expectancy continues to increase
Increase in Population	Continued increases in the population of Missouri, the US and the World
High and Volatile Fuel Prices	Increase in price and volatility of all oil based fuels
Increase in Climate Regulations	Increasing air quality concerns and increasingly stringent environment regulations
Low-cost Batch Manufacturing	Widespread adoption of technologies enabling efficient and low-cost small batch manufacturing
Online Retailing	Shift towards online purchase and point of use delivery leading to reduction of physical retail stores
Re-domestication of Manufacturing	Rebound of US manufacturing jobs returning from overseas
Security Threats	Large increase in the number and magnitude of threats (domestic and abroad)
Increase/Reduction in Funding	Increases or reductions in funding for freight transportation
The "Sensible Network"	Widespread ability to capture and monetize real-time sensing data on all products, vehicles, and facilities across a supply chain at essentially no cost

Defining Future Scenarios

Consideration of the future trends and impacts, listed in **Table F-1**, led the following three future scenarios:

Hungry World

Missouri will play a major role in feeding the ever-increasing world population (35% increase by 2050). As a top 10 agricultural producer in the United States, Missouri's role in feeding the world will continue to require changes in how freight moves.

Global Market

The current global trend of re-shoring manufacturing will continue. Given Missouri's manufacturing sector's history, this would elevate Missouri's position in the global marketplace.

Convenient Living

Missourians travel and freight movements will change as people drive considerably less - seeking to work from home and live in communities where they can walk to jobs, schools, and other services - more shopping will be done online with increasing residential deliveries resulting in the decrease of traditional shopping trips.

Initial Reaction to the Scenarios

Regardless of the scenario, future supply chains will be very different than today. These changes will be visible to Missouri as distribution networks adapt and demands on the freight system shift. Scenario planning helps Missouri to be more flexible and able to adapt to capture future economic development opportunities. Each of the following impacts describes how trends and scenarios could impact the supply chain/distribution network:

Table F-2: Potential Supply Chain Changes ¹

Impacts	Description
Origin (Sourcing)	Sustained increases or reductions in global imports and exports
Destination	Increases in production and usage of alternative fuel sources
Routing	Travel time and reliability is severely impeded by poor system conditions
Volume	Widening of the Panama Canal could dramatically change freight flows
Value Density	Advances in science and technology, such as advanced agricultural pesticides or machinery

A scenario planning workshop was held during the March 2014 Freight Steering Committee meeting. During the workshop, members discussed the potential scenarios and what Missouri would have to do to successfully capture the unique opportunities presented by each scenario.

To prepare for the workshop, stakeholders were provided with an overview of the scenario planning process and alternative future scenario descriptions and each participant was asked the following questions via electronic survey:

- **Question 1:** In the future, if agricultural demand significantly increases in Missouri due to dramatically increasing populations all over the world, which of the following two things would be most impacted?
- **Question 2:** In the future, if manufacturing significantly increases in Missouri due, perhaps, to rising costs overseas and if trade is more open globally, which of the following two things would be most impacted?
- **Question 3:** In the future, if Missourians across the state continually seek the convenience of working from home (traveling less for work during peak hours, easing congestion) and online shopping is used more and more (increasing the last mile delivery, box trucks and vans) and "livable" communities are an increasing trend in urban areas (more trips are made by walking or biking, easing roadway congestion), which of the following two things would be most impacted?

For each question, the respondents were asked to identify which of the distribution impacts, were likely to take place (see **Table F-2** for impact definitions). Results of the survey are shown in **Table F-3**. Many of the results were somewhat expected. The Hungry World scenario identified routing and volume as the largest impacts on distribution network. This is logical as

¹ "Strategic Issues Facing Transportation: Volume 1 Scenario Planning for Freight Transportation Infrastructure Investment" NCHRP 750 Report, 2013. http://onlinepubs.trb.org/onlinepubs/nchrp/nchrp_rpt_750v1.pdf

Missouri imports agriculture inputs and exports the resulting product. The Global Market scenario identified impact to flow origins, volume, and routing, which would coincide with in-state manufacturing growth. Flow destinations and routing were selected for the “Convenient Living in a High Tech Missouri” scenario as freight moves away from big box retailers to more home delivery.

Table F-3: Initial Scenario Survey Results

Scenarios	Impacts						
	Flow Origins	Flow Destinations	Routing	Volume	Value Density	Not Sure	Other
Hungry World	2	1	10	12	0	0	1
Global Market	5	3	7	6	2	0	1
Convenient Living	2	10	6	3	2	0	0

Steering Committee Workshop

After presenting an overview of the scenario planning process, committee members were broken out into three groups for more in-depth discussions on the three alternative futures. The following questions were asked of each group for each scenario:

- How does this impact freight planning in Missouri?
- Will a more multimodal transportation system be needed?
- What kind of risk does this pose to Missouri’s Transportation?
- Does this future require more emphasis on preservation, modernization or expansion type projects?
- Are current funding trends adequate or require higher or less funding?
- Are policy, procedure or regulation changes necessary?
- What partnerships would help lead to success?
- Is there something that we need to include in this future that may present an impact?

Feeding a Hungry World

Participants agreed that this scenario would stress the state’s transportation network and impact bridge conditions, particularly in rural areas. However, urban areas would be impacted as well. The group predicted that with continued funding limitations, solutions to these impacts would be limited.

The group identified transportation connectivity as a major limitation to the ability of Missouri to capture this opportunity. In particular, navigability of the Missouri River, farm-to-market road conditions, and the ability of the interstate system to handle the volume of agricultural products exported beyond the state’s borders. Committee members also agreed a more robust multimodal transportation system would be needed to move agriculturally based freight under this scenario.

As a result, the group encouraged the state to track agricultural trends, to increase and diversify funding opportunities, and to continue relationship building with the private sector.

Changing Access to a Global Market

Under this scenario, the Missouri transportation system would be severely taxed by the dramatic increase in imports (raw materials) and exports (manufactured goods). Particularly challenging, will be the scenario’s effect on suburban and urban areas where most of the state’s workforce and transportation centers are located.

Committee members suggested that additional intermodal facilities would need to be built to capitalize on the existing multimodal freight system. In particular, road-to-rail connectivity is particularly important to link near-sourced Mexican suppliers to Missouri manufacturers. Additional north-south capacity (whether physical or operational) will allow better utilization of ports and rivers. However, MoDOT will have to work with USACE to continue to stress the importance of maintaining channel depth and infrastructure (locks and dams) on the Mississippi and Missouri Rivers to truly capitalize on the significant capacity available

on the inland waterway system. While the steering committee identified many needs, it identified available air cargo capacity as a huge strength for Missouri under this scenario.

To appropriately prepare for a “Global Market” scenario, the committee all agreed that more funding must be provided no matter the mode, but especially for waterways, highways and rail. Without infrastructure investments, Missouri’s location advantages will be meaningless. Current funding processes and incentives need to be changed in order to compete with other states.

Convenient Living in a High Tech Missouri

Committee members quickly recognized that this scenario was very different than the others. It would require a fundamental shift in not only MoDOT operations, but of most (if not all) supply chains in Missouri.

While commuter volumes would decrease, freight flows would increase. These increases would take place on local road networks that were not designed to handle the weight or the geometrics involved with a heavy volume of delivery vehicles. Additionally, this scenario significantly threatens two revenue streams: fuel and sales taxes. The fuel tax would be significantly reduced by the reduction of personal vehicle trips. A decrease in sales tax revenue would occur as more sales happen online.

On the private side, this shift could realign and require the need for additional distribution centers. Additionally, committee members suggested private industries could partner with a company/agency like the United States Postal Service to cross-dock (a logistics practice of unloading materials from an incoming truck or railroad car and loading directly into outbound trucks or rail cars, with little or no storage in between) and consolidate neighborhood deliveries. The group discussed that of all of the scenarios, partnership will be a critical aspect to the success of Missouri adapting and capturing the opportunities associated with this scenario.

Overall Recommendations

While each of the scenarios has key takeaways and lessons learned, there are several commonalities that could reasonably be expected to drive the success of the Missouri Freight System, no matter what scenario. These recommendations will provide critical inputs to the project selection and policy development sections of the *Freight on the Move* effort:

- **Proactive Partnership:** Collaboration within and between the public and private sectors will be critical.
- **Strategic Investment:** Decisions must be made in the context of supporting economic growth through emerging opportunities.
- **Flexibility:** MoDOT processes must be responsive to private sector needs.
- **State of Good Repair:** Focus on road, waterway, rail and bridge improvements.
- **Multimodalism and Connectivity:** The current highway network cannot handle future freight needs. In order to continue the state's economic prominence, new and improved intermodal connectivity points and linkages must take place.
- **Funding:** More infrastructure funding is needed and increased flexibility to allow allocation to solve complex freight challenges across modes.

APPENDIX G

Freight Project List

CENTRAL DISTRICT PROJECT LIST

District	Type	Route	Project Description	Cost Information (Millions)	County	Project ID	Prioritization Category
CD	Highway	50/63	Improve US-50/63 in Jefferson City (Whitton Expressway) from Clark Avenue to Missouri Boulevard	\$50 - \$75	Cole	28	Very High
CD	Highway	70	Improve the I-70 / US-63 interchange in Columbia	\$25 - \$50	Boone	25	High
CD	Highway	50	Complete US-50 as a four-lane highway from Sedalia to California	\$120 - \$140	Pettis, Morgan, Moniteau	5	High



Appendix G: Freight Project List

District	Type	Route	Project Description	Cost Information (Millions)	County	Project ID	Prioritization Category
CD	Rail	Rail	Construct the Hermann universal crossover to improve the MO River Runner train service	\$3 - \$4	Gasconade	35	High
CD	Rail	Rail	Construct the Bonnots Mill universal crossover to improve the MO River Runner train service	\$4 - \$5	Osage	37	High
CD	Highway	50/63	Expand US-50/63 in Jefferson City to six lanes from Broadway Street to Eastland Drive	\$75 - \$100	Cole	26	Medium



Appendix G: Freight Project List

District	Type	Route	Project Description	Cost Information (Millions)	County	Project ID	Prioritization Category
CD	Rail	Rail	Construct third mainline rail track in Cole County (Jefferson City) to better accommodate the MO River Runner trains	\$4 - \$5	Cole	36	Medium
CD	Highway	54	Improve the Summit Drive/US-54 interchange in Holts Summit by adding two ramps to the north	\$2 - \$2.5	Callaway	8	Medium
CD	Highway	63	Construct US-63 alternate route around Rolla	\$25 - \$50	Phelps	16	Medium



Appendix G: Freight Project List

District	Type	Route	Project Description	Cost Information (Millions)	County	Project ID	Prioritization Category
CD	Highway	54/70	Install truck stop/rest area in Kingdom City nearest fuel access in Callaway County	\$10 - \$15	Callaway	30	Medium
CD	Waterways	Waterways	New dock and road at Howard/Cooper Port	\$.75 - \$1	Howard	44	Medium
CD	Highway	44	Improve vertical clearance under the BNSF Bridge on I-44 east of Phillipsburg	\$3 - \$5	Laclede	3	Medium
CD	Highway	54	Missouri River Bridge to US-63 E. and W./ MO-94 in Jefferson City	\$1.3 - \$1.5	Cole, Callaway	15	Medium



Appendix G: Freight Project List

District	Type	Route	Project Description	Cost Information (Millions)	County	Project ID	Prioritization Category
CD	Highway	70	Build bypass of I-70 around Columbia	\$350 - \$400	Boone	22	Medium



KANSAS CITY DISTRICT

District	Type	Route	Project Description	Cost Information (Millions)	County	Project ID	Prioritization Category
KC	Highway	35	I-35 Interchange at US-169 (Northwest Downtown Loop) – Reconstruction	\$70 - \$75	Jackson	74	Very High
KC	Highway	35, 70, 670, 71	Downtown Loop Improvements in Kansas City (I-35, I-670 and US-71)	\$75 - \$100	Jackson	102	Very High
KC	Rail	Rail	Improve the KC Terminal Railroad's overpass on Independence Ave.	\$25 - \$30	Jackson	109	Very High
KC	Highway	49	Corridor improvements, including adding lanes from 155th St. to North Cass Pkwy to address mobility and safety	\$20 - \$25	Cass	75	Very High



Appendix G: Freight Project List

District	Type	Route	Project Description	Cost Information (Millions)	County	Project ID	Prioritization Category
KC	Highway	71	Corridor improvements along Bruce R. Watkins Dr. from 55th Street to Bannister Rd. to address safety	\$60 - \$80	Jackson	92	Very High
KC	Rail	Rail	Construct double track from Lee's Summit to Strasburg to better accommodate MO River Runner trains	\$45 - \$50	Jackson, Cass	105	Very High
KC	Highway	70	Interchange improvements at I-435 to address mobility, safety and bridge conditions	\$40 - \$45	Jackson	89	High
KC	Highway	35	Interchange improvements at MO-152 in Liberty	\$10 - \$15	Clay	71	High



Appendix G: Freight Project List

District	Type	Route	Project Description	Cost Information (Millions)	County	Project ID	Prioritization Category
KC	Highway	70	Corridor and interchange improvements from I-435 to I-470 to address mobility and safety	\$200 - \$225	Jackson	90	High
KC	Highway	70	Corridor improvements, including adding lanes from Blue Springs (MO-7) to just east of Oak Grove (MO-F) to address mobility and safety	\$40 - \$45	Jackson	84	High
KC	Waterways	Waterways	Rail connection and repair at Kansas City Port	\$3.9 - \$4.2	Jackson	114	High



Appendix G: Freight Project List

District	Type	Route	Project Description	Cost Information (Millions)	County	Project ID	Prioritization Category
KC	Rail	Rail	Construct Kingsville siding to better accommodate MO River Runner trains	\$15 - \$16	Johnson	107	High
KC	Rail	Rail	Construct Knob Noster siding extension to better accommodate MO River Runner trains	\$15 - \$16	Johnson	106	High
KC	Aviation	Aviation	Relocate POST 28 access gate and add new security structure, gate and pavement	\$2.50	Platte	215	Medium
KC	Aviation	Aviation	Perimeter fence and gates around AOA to meet new standards	\$6	Platte	214	Medium



Appendix G: Freight Project List

District	Type	Route	Project Description	Cost Information (Millions)	County	Project ID	Prioritization Category
KC	Highway	49/7	Improve the I-49 and MO-7 interchange	\$10 - \$15	Cass	103	Medium
KC	Rail	Rail	KCT Realign, raise and add a third track in north/south corridor	\$23	Jackson	500	Medium
KC	Highway	13	Corridor improvements from I-70 to MO-V/OO (Warrensburg east loop)	\$55 - \$60	Lafayette, Johnson	61	Medium
KC	Highway	29	Operational improvements from north of I-635 to MO-210 in North Kansas City	\$40 - \$45	Clay, Platte	66	Medium



Appendix G: Freight Project List

District	Type	Route	Project Description	Cost Information (Millions)	County	Project ID	Prioritization Category
KC	Highway	70	Interchange improvements in Odessa	\$10 - \$15	Lafayette	88	Medium
KC	Waterways	Waterways	Acquire container loading equipment at Kansas City Port	\$1.1 - \$1.3	Jackson	110	Medium
KC	Highway	24	Replace the US-24 Bridge over RR west of I-435	\$20 - \$25	Jackson	501	Medium



NORTHEAST DISTRICT PROJECT LIST

District	Type	Route	Project Description	Cost Information (Millions)	County	Project ID	Prioritization Category
NE	Highway	54	Upgrade US-54 from Mexico to Louisiana with new four-lane roadway	\$145 - \$155	Audrain, Pike	137	Medium
NE	Waterways	Waterways	Terminal improvements - B at Lewis Canton Port	\$.06 - \$.1	Lewis	162	Medium
NE	Waterways	Waterways	Roadway improvements at Lewis Canton Port	\$.35 - \$.4	Lewis	163	Medium



Appendix G: Freight Project List

District	Type	Route	Project Description	Cost Information (Millions)	County	Project ID	Prioritization Category
NE	Highway	70	Straighten I-70 at the rail overpass between High Hill and Jonesburg	\$13 - \$14	Warren	155	Medium
NE	Highway	63	Corridor improvements (including lanes) from Kirksville to Iowa state line	\$60 - \$70	Adair, Schuyler	151	Medium
NE	Highway	70	Improve the overpass access to the Truxton truck stop	\$5-\$10	Montgomery	154	Medium
NE	Highway	61	Alternate roadway west of Hannibal (Hannibal Expressway)	\$60 - \$65	Marion	142	Medium



Appendix G: Freight Project List

District	Type	Route	Project Description	Cost Information (Millions)	County	Project ID	Prioritization Category
NE	Highway	70	Construct a new interchange in Warrenton west of MO-MM (or at existing Stracks Church Rd.) to reduce existing traffic on MO-47 and bring more economic development to the area	\$10 - \$15	Warren	153	Low
NE	Highway	70/47	Construct a new interchange at I-70 and MO-47 in Warrenton	\$14 - \$16	Warren	157	Low
NE	Highway	63	Four-lane the alternate route around Kirksville in Adair County	\$25 - \$30	Adair	148	Low



Appendix G: Freight Project List

District	Type	Route	Project Description	Cost Information (Millions)	County	Project ID	Prioritization Category
NE	Highway	63	Construct an interchange at US-63 and MO-11 intersection near Kirksville in Adair County	\$6 - \$8	Adair	150	Low



NORTHWEST DISTRICT PROJECT LIST

District	Type	Route	Project Description	Cost Information (Millions)	County	Project ID	Prioritization Category
NW	Highway	65	Shared four-lane roadway from north of Marshall to Chillicothe	\$65 - \$75	Saline, Lafayette, Carroll, Livingston	183	High
NW	Highway	229/59	Reconstruct the I-229/US-59 interchange in St. Joseph	\$20 - \$25	Buchanan	187	High
NW	Highway	36	Interchange improvements at US-36 and Riverside Rd.	\$6 - \$9	DeKalb	179	High



Appendix G: Freight Project List

District	Type	Route	Project Description	Cost Information (Millions)	County	Project ID	Prioritization Category
NW	Highway	29	Construct a diverging diamond interchange at I-29 and Frederick	\$12 - \$15	Buchanan	131	Medium
NW	Highway	35	Interchange improvements at I-35 and US-36 in Cameron ranging from improving the bridge to reconstructing entire interchange	\$2.5 - \$45	Dekalb	176	Medium
NW	Highway	229/A	Construct ramps on east side of existing interchange to accommodate all traffic movements	\$6 - \$8	Buchanan	189	Medium
NW	Highway	71	Four-lane US-71 from Maryville to Iowa	\$65 - \$80	Nodaway	184	Medium

Appendix G: Freight Project List

District	Type	Route	Project Description	Cost Information (Millions)	County	Project ID	Prioritization Category
NW	Highway	35	Improve I-35 from Cameron to Lathrop	\$10 - \$12	Clinton	175	Medium
NW	Waterways	Waterways	Additional liquid storage tanks (estimated at 5) at St. Joseph Port	\$4.5 - \$5	Buchanan	197	Medium
NW	Waterways	Waterways	Bio Diesel Liquid Storage - Tanks and Transfer Station at St. Joseph Port	\$2.5 - \$3	Buchanan	196	Medium



SOUTHEAST DISTRICT PROJECT LIST

District	Type	Route	Project Description	Cost Information (Millions)	County	Project ID	Prioritization Category
SE	Rail	Rail	Construct New Bourbon Port connection from the port to I-55 and a rail connection to St. Francois County (Unknown cost for rail connection)	\$25 - \$27	Ste. Genevieve	254	Very High
SE	Waterways	Waterways	Construct RR Wye between PCPA RR & BNSF at Pemiscot County Port	\$2.4 - \$2.6	Pemiscot	285	High
SE	Highway	55	Raise grade of interstate for 2 miles at St. John's Bayou	\$8 - \$10	New Madrid	223	High



Appendix G: Freight Project List

District	Type	Route	Project Description	Cost Information (Millions)	County	Project ID	Prioritization Category
SE	Waterways	Waterways	North tracks 4, 5, & 6 at SEMO Port	\$.5 - \$.6	Scott	270	High
SE	Waterways	Waterways	Bridge Upgrades at SEMO Port	\$.4 - \$.5	Scott	269	High
SE	Waterways	Waterways	Elevate sections of road into port and pave entire road (two-phases) at New Bourbon Port	\$1.6 - \$1.8	Ste. Genevieve	280	High
SE	Waterways	Waterways	Extension of RR Mainline in Industrial Park #1 at Pemiscot County Port	\$.3 - \$.4	Pemiscot	260	High



Appendix G: Freight Project List

District	Type	Route	Project Description	Cost Information (Millions)	County	Project ID	Prioritization Category
SE	Highway	SR84/I55	Roadway from MO-84 to I-55 from Pemiscot County Port to provide additional capacity	\$3.5 - \$5	Pemiscot	PC145	High
SE	Highway	55	Reconstructed interchange, leads to major Illinois bridge I-55/Exit 93 South Kings Highway/I-55/MO- 74	\$10 - \$15	Cape Girardeau	219	Medium
SE	Highway	55	Corridor and overpass improvements into St. Jude's industrial park	\$4 - \$6	New Madrid	225	Medium
SE	Highway	67	Corridor improvements including 4-laning from south of MO-160 to the Arkansas state line	\$35 - \$40	Butler	241	Medium



Appendix G: Freight Project List

District	Type	Route	Project Description	Cost Information (Millions)	County	Project ID	Prioritization Category
SE	Waterways	Waterways	Grain 2 & 3 Tracks and Tail Track 2 at SEMO Port	\$.9 - \$.1	Scott	275	Medium
SE	Water ways	Waterways	Missouri Landing Improvements at Mississippi County Port	\$.05 - \$.1	Mississippi	261	Medium
SE	Water ways	Waterways	Construct two drive over hoppers at New Bourbon Port	\$.2 - \$.3	Ste. Genevieve	263	Medium
SE	Water ways	Waterways	Dock Rail Spurs at SEMO Port	\$.35 - \$.4	Scott	266	Medium



Appendix G: Freight Project List

District	Type	Route	Project Description	Cost Information (Millions)	County	Project ID	Prioritization Category
SE	Waterways	Waterways	Loop Tracks Fill Project - Phase 2 Fill at SEMO Port	\$.4 - \$.5	Scott	268	Medium
SE	Rail	Rail	Construct Stoddard County Industrial Park Spur	\$1 - \$2	Stoddard	252	Medium
SE	Waterways	Waterways	Construction of two coffer cells at New Bourbon Port	\$.6 - \$.7	Ste. Genevieve	273	Medium
SE	Waterways	Waterways	Dolphins - Harbor North Side at SEMO Port	\$.5 - \$.6	Scott	271	Medium



Appendix G: Freight Project List

District	Type	Route	Project Description	Cost Information (Millions)	County	Project ID	Prioritization Category
SE	Waterways	Waterways	Dry Bulk Warehouse at SEMO Port	\$.9 - \$1	Scott	276	Medium
SE	Highway	55/57/60	Construct a new interchange at I-55, I-57 and US-60	\$20 - \$25	New Madrid	246	Medium
SE	Waterways	Waterways	Warehouse Construction at New Madrid Port	\$1.2 - \$1.3	New Madrid	277	Medium
SE	Highway	55	Interchange and outer road to US-61	\$8 - \$10	Cape Girardeau	224	Medium



Appendix G: Freight Project List

District	Type	Route	Project Description	Cost Information (Millions)	County	Project ID	Prioritization Category
SE	Rail	Rail	Construct Lilbourn Industrial Park Spur	\$1 - \$2	New Madrid	251	Medium
SE	Waterways	Waterways	Land Purchase Phase 1 of 2 at New Madrid Port	\$1.6 - \$1.8	New Madrid	281	Medium
SE	Waterways	Waterways	Purchase Land for Industrial Park #2 at Pemiscot County Port	\$1.7 - \$1.9	Pemiscot	282	Medium
SE	Waterways	Waterways	Land Purchase Phase 2 of 2 at New Madrid Port	\$1.5 - \$1.7	New Madrid	279	Medium



ST. LOUIS DISTRICT PROJECT LIST

District	Type	Route	Project Description	Cost Information (Millions)	County	Project ID	Prioritization Category
SL	Highway	64	Capacity Improvements from I-70 to MO-K	\$30 - \$35	St. Charles	331	Very High
SL	Highway	64	Reconstruct the 6th St. ramp and add an I-64 through lane	\$24 - \$28	City of St. Louis	327	Very High
SL	Highway	64	Interchange improvements at Jefferson (full interchange)	\$10 - \$12	City of St. Louis	328	Very High



Appendix G: Freight Project List

District	Type	Route	Project Description	Cost Information (Millions)	County	Project ID	Prioritization Category
SL	Highway	70	Corridor improvements on I-70 from I-64 to the Missouri River (near MO-94)	\$100 - \$130		351	Very High
SL	Highway	44/55	Upgrade entrance and exit ramps at Gravois and Tucker (12th St.) in St. Louis City	\$10 - \$12	City of St. Louis	378	Very High
SL	Highway	44/55	Improve I-44 and I-55 Interchange with a new lane from I-44 west to I-55 south	\$75 - \$80	City of St. Louis	380	Very High
SL	Rail	Rail	Improve Merchants Rail Bridge	\$150-\$180	City of St. Louis	391	Very High



Appendix G: Freight Project List

District	Type	Route	Project Description	Cost Information (Millions)	County	Project ID	Prioritization Category
SL	Highway	70	Reconstruct the I-64/I-70/US 61 interchange and add capacity from Wentzville Parkway to I-64 in St. Charles	\$80 - \$100	Warren, St. Charles	348	High
SL	Highway	61	Corridor improvements on US-61 from Lincoln Co. to I-70	\$15 - \$20	St. Charles	324	High
SL	Highway	67	Corridor improvements from Page Ave. to I-70	\$5 - \$8	St. Louis County	338	High
SL	Highway	270	Interchange improvements at MO-180 (St. Charles Rock Road)	\$10 - \$12	St. Charles	371	High



Appendix G: Freight Project List

District	Type	Route	Project Description	Cost Information (Millions)	County	Project ID	Prioritization Category
SL	Rail	Rail	Construct new track from N. Market to Biddle St. to better accommodate MO River Runner trains	\$6 - \$7	City of St. Louis	388	High
SL	Aviation	Aviation	Connect Lambert International Airport cargo area with an industrial complex and connections to I-70	\$10 - \$15	St. Louis	309	High
SL	Highway	70	Interchange improvements at I-270	\$25 - \$30	St. Louis	354	High
SL	Highway	64/270	Rebuild the I-64/I-270 interchange to alleviate congestion	\$60 - \$80	St. Louis	381	High



Appendix G: Freight Project List

District	Type	Route	Project Description	Cost Information (Millions)	County	Project ID	Prioritization Category
SL	Highway	55	Interchange and corridor improvements on I-55 from MO-Z (Pevely) to US-67, including the I-55/US-67 interchange	\$150-\$200	Jefferson	322	High
SL	Waterways	Waterways	Municipal River Terminal, N Dock, Sheet Steel Dock Piling Repairs at St. Louis City Port	\$.5 - \$.6	City of St. Louis	401	Medium
SL	Waterways	Waterways	Municipal River Terminal, N Dock, Piling Anchor Tie Head Assemblies and Plate Repairs at St. Louis City Port	\$.1 - \$.15	City of St. Louis	395	Medium
SL forum	Aviation	Aviation	Air cargo capacity is available but the cargo facilities are dated, small, no refrigeration.	Unknown	St. Louis	408	Medium



Appendix G: Freight Project List

District	Type	Route	Project Description	Cost Information (Millions)	County	Project ID	Prioritization Category
SL forum	Aviation	Aviation	Improvements at Lambert Airport including expanding the cargo facility to the north side of the airport and redeveloping the former Boeing production facility for cargo development and expansion	\$3.10	St. Louis	407	Medium



STATEWIDE PROJECT LIST

District	Type	Route	Project Description	Cost Information (Millions)	County	Project ID	Prioritization Category
Statewide	Highway	I-70	Improve I-70 between Kansas City and St. Louis (Ranges from adding a third lane to dedicated truck lanes)	\$2,000 - \$4,000		424	Very High
Statewide	Highway	I-70	Improve I-70 between Kansas and I-470	Unknown		498	Very High
Statewide	Highway	I-70	Improve I-70 between Lake St. Louis and I-55/64	Unknown		499	Very High

Appendix G: Freight Project List

District	Type	Route	Project Description	Cost Information (Millions)	County	Project ID	Prioritization Category
Statewide	Highway	I-44	Improve I-44 between St. Louis and the Oklahoma state line (Ranges from adding a third lane to dedicated truck lanes)	\$2,000 - \$2,500		423	High



SOUTHWEST DISTRICT PROJECT LIST

District	Type	Route	Project Description	Cost Information (Millions)	County	Project ID	Prioritization Category
SW	Rail	Rail	BNSF Springfield rail terminal and improved intermodal connections. Known as West Wye Rail Project	\$3.10	Greene	489	Very High
SW	Highway	49	Interchange improvements at I-49/MO-171 in the Carthage area and designate MO-249 as an interstate.	\$40 - \$80	Jasper	457	High
SW	Highway	13	Add lanes to MO-13 from Clinton to Warrensburg	\$35 - \$45	Henry, Johnson	482	High



Appendix G: Freight Project List

District	Type	Route	Project Description	Cost Information (Millions)	County	Project ID	Prioritization Category
SW	Highway	65	Capacity improvements from US-60 in Springfield to MO-F in Ozark	\$45 - \$60	Greene, Christian	471	High
SW	Highway	44	Interchange ramp improvements at MO-38 in Marshfield.	\$.5 - \$.8	Webster	448	Medium
SW	Highway	44	Interchange improvements at I-44 and MO-125 in Strafford	\$2 - \$4	Greene	451	Medium
SW	Highway	44	Interchange improvements at I-49 in Fidelity.	\$25 - \$35	Newton	452	Medium



Appendix G: Freight Project List

District	Type	Route	Project Description	Cost Information (Millions)	County	Project ID	Prioritization Category
SW	Highway	65	Interchange improvements at Main St. in Warsaw	\$5 - \$6	Benton	475	Medium
SW	Highway	49	Construct Bella Vista Bypass	\$50 - \$55	McDonald	455	Medium
SW	Highway	65	Intermittent passing lanes and turn lanes between Preston and Buffalo	\$10 - \$20	Dallas, Hickory	468	Medium
SW KBRPC	Highway	54	Roadway improvements to accommodate trucks, including truck parking in Wheatland	Unknown	Hickory	476	Medium



Appendix H

District Freight Summaries

CENTRAL DISTRICT PROFILE: Freight and the District's Economic Future



Global trade and new technologies continue to transform the economy, redefining the way businesses operate, challenging supply chains and transportation networks, and creating new customer opportunities for Missouri businesses in places where they were once inconceivable. Businesses and their employees are more dependent than ever on integrated, agile, and efficient transportation networks to sustain economic competitiveness, facilitate journeys to work, and connect to markets. The military facilities in this district also depend on these transportation networks to maintain their state of readiness. Whiteman Air Force Base and Fort Leonard Wood have very different missions, but both rely on multimodal transportation networks to ensure maintenance of B-2 Spirit stealth bombers and critical training programs.

To compete in this global marketplace, businesses must optimize every asset—workforce skills, competitively priced products, and reliable transportation systems—to ensure their customers receive quality goods and services when they expect them. As the importance of trade and the demands of customers continue to evolve, Missouri companies often find freight an increasingly important factor in sustaining and enhancing their competitive position in the marketplace. Freight supports the domestic and international trade of Missouri businesses, and supports State and local economic development and job growth.

Central Missouri Population Trends

Missouri's population is projected to grow, with the 2012 population of 6,021,988 increasing to 7,159,350 by 2040. The population growth experienced by the MoDOT Central District from 2000 to 2012 is also expected to continue, with the 2012 population of 658,377 projected to grow to 831,750 by 2040.¹ Gasconade and Howard counties experienced a slight decline in population between 2000 and 2012, but between 2012 and 2040 all of the District's 18 counties are projected to gain population.

Boone, Camden, Phelps, and Pulaski counties experienced the greatest percentage growth in population from 2000 to 2012. Boone County, with the largest population by far, accounted for more than 40 percent of the District's population increase and is expected to be responsible for more than half of the region's growth between 2012 and 2040. Population growth often drives the expansion of non-traded sector businesses such as local professional services (legal, accounting, and medical), local retail trade, real estate and financial services, and food service and restaurants.

Freight is an increasingly important factor in sustaining and enhancing the economic competitiveness of businesses in Missouri and in the Central District.

¹ US Census Intercensal Estimates, July 2000; US Census Annual Estimates; 2013 CEDDS by Woods and Poole Economics

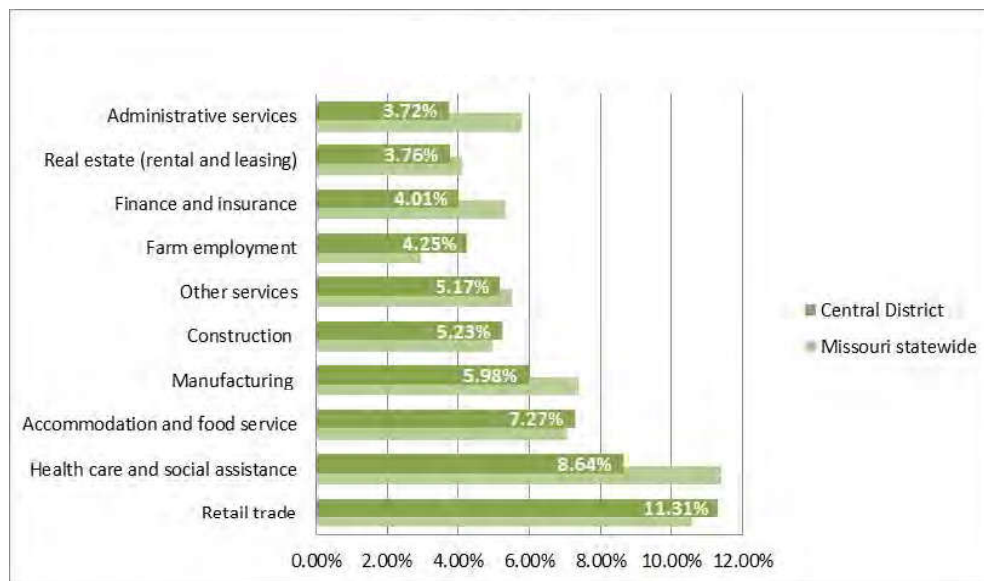
Central District Profile

Transportation Dependence: Missouri and the Central Missouri Economy

Freight transportation represents a key competitiveness factor for Central District businesses. Companies today compete on more than product quality and cost. The transportation networks serving their facilities must provide reliable connections to buyers, and must link to a multitude of markets to ensure timely deliveries of goods and services and access for employees and customers. Some business sectors use transportation facilities and services more extensively than others. An industry sector's dependence on transportation can be measured by examining the amount the sector spends on transportation as a share of its total output.² Transportation satellite accounts provide national data regarding the amount spent on transportation per dollar of output for various sectors.

To better understand the role freight and goods movement play in central Missouri and the contribution of multimodal transportation to the economic vitality of the region's key industry sectors, the project team evaluated the importance of these key industrial sectors based on the non-government employment concentrations in the region. Almost 60 percent of the District's non-government employment is concentrated in 10 sectors: retail and wholesale trade, health care and social services, accommodation and food service, manufacturing, construction, other services, farm employment, finance and insurance, real estate, and administrative services.³ **Figure 1** shows the breakdown of these employment sectors, by percentage, for the Central District and for the State.

Figure 1: Top Ten Non-Government Employment Sectors for the Central District



As noted in **Figure 1**, the importance of transportation to these key industry sectors can be measured by the amount each sector spent on transportation as a share of its total output.

The project team evaluated several primary industry sectors and identified the corresponding industrial classification codes for each key sector in order to compare the applicable transportation costs per dollar of product output using the transportation satellite accounts research. Key business sectors for the Central District are shown in **Table 1**.

² "Transportation Satellite Accounts: A Look at Transportation's Role in the Economy," U.S. DOT Research and Innovative Technology Administration

³ Bureau of Labor Statistics, US Census 2012, County Business Patterns

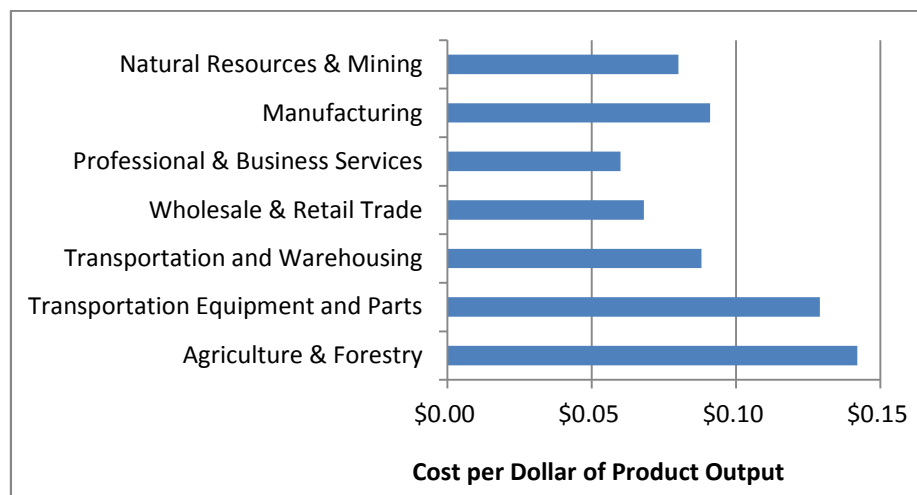
Central District Profile

Table 1: North American Industrial Classifications for Key Industrial Sectors in the Central District

Industrial Sectors	North American Industrial Classification Sector
Construction	Construction
Agribusiness	Agriculture
Transportation and logistics	Transportation and Warehousing
Machine manufacturing	Manufacturing
Electrical equipment manufacturing	Manufacturing

Figure 2 below shows the transportation cost per dollar of product output for several important industry sectors in the Central District based on their North American Industrial Classification System, or NAICS, code. Improvements in transportation costs and services would have a significant effect on the profitability of companies in these industries, as lower transportation costs and more reliable service help reduce the cost of materials, resulting in lower overall production costs. Reliable delivery of materials can enhance productivity, and reducing distribution costs to the consumer may also improve competitiveness.

*Figure 2: Transportation Cost as a Share of Sector Output
(Transportation cost per \$ of product value)*



Source: Transportation Satellite Accounts database, Bureau of Transportation Statistics, Research and Innovation Technology Administration

The Central District has been successful in retaining and attracting core cluster transportation-dependent businesses in several significant economic sectors as described in **Table 2**⁴:

⁴ Pattern Analysis Central Region, MERIC

Central District Profile

Table 2: Economic Sectors the Central District has retained and attracted transportation-dependent businesses

Manufacturing and Advanced Manufacturing	Food Processing	Chemical Manufacturing
Henniges Automotive	Beyond Meat	Behr Process Corporation
3M	Bimbo Bakeries	Unilever
Detroit Tool Metal Products	Quaker Oats	
	Unilever	

Economic Development Trends

The Central District included about 6.5 percent of the State's population in 2008. Healthcare, education, public administration, accommodation and food services, and retail are the largest employment sectors, but several freight-dependent sectors also contribute significantly to the District's economy. These include construction, agribusiness, transportation and logistics, machine manufacturing, and electrical equipment manufacturing.

Construction

Construction ranked sixth in employment in the Central District in 2011 with 19,647 jobs, or more than five percent of all workers in the region. Carpenters are among the top 20 job openings in the Missouri Economic Research and Information Center (MERIC's) 2022 outlook, with 1,010 openings anticipated between 2012 and 2022. Of these openings, 62 percent are due to growth and 38 percent will replace workers who retire or shift to other industries. According to MERIC, carpenters can expect above average job growth, job openings, and wages. The average wage for carpenters in 2013 was \$41,657.⁵ For the State as a whole, both specialty trade contractors and construction of buildings ranked among the top ten industries (sixth and seventh, respectively) for new business formations in 2013. The northern part of the Central District had a higher rate of construction startups than the State as a whole.

Agribusiness

Missouri ranks second in the nation for the number of farms, and agribusiness is especially important in Moniteau, Maries, Osage, Gasconade, and Washington Counties. In 2009 these counties had a location quotient for agribusiness greater than 1.5, indicating a higher share of employment in this sector compared to the nation as a whole. Morgan, Laclede, and Howard Counties have a higher than average share of agriculture and agribusiness jobs as well. Continuing improvements in technology and agricultural productivity have led to a reduction in farm labor across the State. More and more Missouri farmers are taking on other jobs to supplement their income.⁶ The average farm size in the State has shrunk in recent years while the number of farms has increased. The 2012 Census of Agriculture, conducted every five years by the U.S. Department of Agriculture (USDA), indicated that across the U.S. both farm sales and production expenses reached record highs in 2012. Three quarters of all farms in the U.S. had sales of less than \$50,000, and together these smaller farms produced less than 3 percent of farm products sold. Also, 87 percent of U.S. farms were operated by individuals or families and the average age of principal operators was 58.3 years. Although the average age is 58.3, the number of young startup operators increased more than 11 percent between 2007 and 2012.⁷

Organic farming is seeing increased interest in Missouri and in several of the counties in the Central District (Boone, Callaway, Maries, Morgan, Miles, and Camden). Nationwide sales of organic farm products increased from \$1.7 billion to \$3.12 billion from 2007 to 2012, but still accounted for only 0.8 percent of all U.S. agricultural production.⁸

Food processing is also important to the economy of the Central District. National brands such as Kraft Foods, Frito-Lay/Quaker Oats, PepsiCo, Coca-Cola, and Cargill all have processing facilities in the area. Beyond Meat, which Fast Company magazine named the World's Most Innovative Company for Food in 2014, makes plant-based beef and chicken substitutes at their plant in Columbia using ideas and research developed at the University of Missouri.

⁵ MERIC, Central Region Top Openings 2012-2022

⁶ MERIC, Missouri Economic Research Brief: Farm and Agribusiness, March 2009

⁷ USDA 2012 Census of Agriculture, available at www.agcensus.usda.gov

⁸ Ibid.

Central District Profile

Transportation and Logistics

Transportation, warehousing, and logistics companies make up another significant employment sector in Central Missouri, and such companies grew by more than 19 percent between 2003 and 2007, much higher than the national average rate of 1.5 percent. Dollar General, Home Depot, Scholastic, Walmart, and Brookstone all have major distribution centers in the region, and Midway USA, a major retailer and wholesale supplier of hunting and gun-related products, is headquartered in Columbia. Employment in the industry held steady during the recent recession, and the outlook for jobs in this sector is strong. MERIC projects an increase of 1,749 jobs for laborers and freight, stock, and materials movers in the region between 2012 and 2022, and an additional 1,260 jobs for heavy and tractor-trailer truck drivers over the same period; both occupations are ranked among the top 20 for job growth, number of openings, and wages.⁹ These figures represent openings due to growth as well as retirement, turnover, and workers shifting to other industries. However, a nationwide shortage of truck drivers in August 2014 has resulted in as many as 40,000 openings across the country remaining unfilled.¹⁰ Truck drivers are third on the list of ManpowerGroup's 2013 Talent Shortage Survey, and the situation is expected to intensify as demand for shipping via truck grows and drivers retire; in 2014 the average age for truck drivers nationwide is 50.

The District is a desirable location for logistics and distribution centers due to its proximity to I-70 and its position in the center of the State and the U.S. Missouri is within 600 miles of 50 percent of U.S. households and 52 percent of U.S. manufacturing establishments. Lower land costs and lower than average labor costs are other contributing factors. Nationally, the outlook for the industry is good as investment in transportation and logistics should correlate with growth in the U.S. economy.

Machine Manufacturing

This sector generates significant employment for the region as well. Nordyne, a maker of high efficiency heating and cooling systems, has facilities in Tipton and Booneville. Semco, based in Columbia, manufactures HVAC and energy recovery equipment. Several firms that manufacture parts for the transportation industry are also located in central Missouri including OTSCON, which makes parking brake systems, and Dana Corporation, which manufactures power trains. As the global economy recovers, analysts expect "quite impressive" growth in the worldwide market for industrial machinery between 2014 and 2018,¹¹ driven by consumer products such as cars and food as well as oil and gas exploration, construction, and green energy. Annual growth is projected at 6.3 percent in 2014 (more than double the 2.9 percent increase seen in 2013) and growth should average between five and six percent between 2014 and 2018.

Electrical Equipment Manufacturing

The Central District is home to several electrical equipment manufacturing firms; they pay above-average wages and employ a relatively large workforce. Hubbell Power Systems, Inc., Schneider Electric: Square D, Meramec Electrical Products, Marine Electrical Products, and Watlow Industries are significant employers in this sector.

Importance of Freight to the Economic Development Future of the Central District

Manufacturing and Exports

Manufacturing continues to be a vital part of Missouri's economy and exports of Missouri-manufactured goods continue to increase. Missouri businesses exported over \$3 billion in goods by the close of the first quarter of 2014, and nearly \$13 billion in 2013.^{12,13} Four primary industries in the manufacturing sector accounted for over 62 percent of Missouri exports: transportation equipment, chemicals, food and kindred products, and machinery related businesses. These industries exported over \$8 billion in products in 2013.¹⁴ Agricultural products, fabricated metal products, electrical equipment, minerals and ores, primary metal manufacturing, and computer and electronic products round out the state's top ten exports for 2013. Over 6,100 businesses in Missouri exported products and services in 2012, and 89.5 percent of Missouri's exports are manufactured goods produced in communities all around the State. Manufacturing exports support nearly 107,000 jobs in Missouri, and 85 percent of the companies engaged in exporting goods and services are small businesses.¹⁵

Manufacturing matters in Missouri because:

⁹ MERIC, Central Region Top Openings 2012-2022.

¹⁰ Williams, G. Chambers. "Trucking industry faces uphill battle to recruit drivers." The Tennessean, August 25, 2014.

¹¹ Cassell, Jonathan. "Rise of the Machines: Industrial Machinery Market Growth to Double in 2014." IHS Technology, April 16, 2014.

¹² WISER Export Trade data, 2014

¹³ U.S. Census, Freight Trade State Exports, Missouri

¹⁴ MERIC, Missouri Department of Economic Development, March 2013

¹⁵ U.S. Department of Commerce, International Trade Administration, National Association of Manufacturing, 2013

Central District Profile

- Employees in manufacturing firms earn an average of \$77,060 annually in pay and benefits, while average workers in all industries earn \$60,168. This means manufacturing jobs pay, on average, 19.9 percent more than non-manufacturing jobs.¹⁶
- Manufacturing firms account for nearly two-thirds of all research and development in the U.S. and are a leading user of new technologies and processes.¹⁷
- Manufacturing has the highest multiplier effect of any economic sector. For every dollar spent in manufacturing another \$1.48 is added to the economy, helping to stimulate economic growth.
- Missouri's economy is intrinsically linked to its ability to move people, materials, components, and finished goods within the State and to national and international destinations.
- Missouri's principal trading partners are Canada, Mexico, China, Japan, and Korea.¹⁸ The five industries with the most significant job dependence on exports include grain farming, oilseed farming, wholesale trade, and aircraft manufacturing.
- Export products are intrinsically dependent on multimodal freight transportation.

Conclusion

Missouri's Central District is well-positioned for economic growth. Numerous investments in manufacturing facilities are planned or under way by firms such as 3M, Fluid Power Support, Brewer Science Inc., and Meramec Electrical Products. These expansions will add jobs in the area, both directly and indirectly. Agriculture is vital to the region's economy, and food processing giants including Kraft Foods and Cargill as well as innovative firms such as Beyond Meat should continue to support significant employment. Increasing national and worldwide demand for central Missouri agricultural and manufactured products will, in turn, drive growth in the freight and warehousing sector, resulting in more jobs for truck drivers, freight handlers, and logistics experts. Employment growth in all of the above sectors and in service industries such as retail trade, health care and social assistance, and accommodations and food services—which represent the region's top three industries for jobs—will contribute to the projected population growth. More residents will lead to higher demand for consumer products that must be delivered to local stores and homes.

All of this depends on a dependable and efficient freight network. Manufacturers of machinery, electrical components, and other products depend on the statewide freight infrastructure to deliver raw materials and components and carry finished products to assembly plants, distributors, and end users. Farms, including the growing number of organic farm establishments, and food processors rely on the region's rail, highways, and river ports to deliver their output to markets across the country and around the world. They also depend on secondary roadways to link them with the broader transportation network, and businesses rely on these secondary roads for time-sensitive deliveries. Trucks of all sizes travel the highways and secondary roads to supply grocery stores, offices, construction sites, and homes with the goods, materials, and products they need every day.

Research reveals that investment in physical infrastructure reduces costs and improves efficiencies in conducting business, boosts job creation, and fosters growth cycles within countries.¹⁹ Based on the above research maintaining the existing freight system and expanding both its capacity and connectivity in ways that increase reliability and reduce transportation costs are critical to the economic vitality of the Central District.

¹⁶ Bureau of Economic Analysis, Industry Economic Accounts, 2011

¹⁷ Brookings Institute, Metropolitan Policy Program, "Why Does Manufacturing Matter?" February 2012

¹⁸ US Census, State Exports, Foreign Trade, 2013

¹⁹ Deloitte LLP and the Council on Competitiveness, "2013 Global Manufacturing Competitiveness Index"

KANSAS CITY DISTRICT PROFILE: Freight and the District's Economic Future



Global trade and new technologies continue to transform the economy, redefining the way businesses operate, challenging supply chains and transportation networks, and creating new customer opportunities for Missouri businesses in places where they were once inconceivable. Businesses and their employees are more dependent than ever on integrated, agile, and efficient transportation networks to sustain economic competitiveness, facilitate journeys to work, and connect to markets.

To compete in this global marketplace, businesses must optimize every asset—workforce skills, competitively priced products, and reliable transportation systems—to ensure their customers receive quality goods and services when they expect them. As the importance of trade and the demands of customers continue to evolve, Missouri companies often find freight an increasingly important factor in sustaining and enhancing their competitive position in the marketplace. Freight supports the domestic and international trade of Missouri businesses, and supports State and local economic development and job growth.

Kansas City Population Trends

Missouri's population is projected to grow, with the 2012 population of 6,021,988 increasing to 7,159,350 by 2040. The modest population growth experienced by the MoDOT Kansas City District from 2000 to 2012 is expected to continue, with the 2012 population of 1,273,583 projected to grow to 1,567,440 by 2040.¹ Ray and Saline Counties experienced a decline in population between 2000 and 2012, but only Saline County is projected to decrease in population between 2012 and 2040.

Platte, Clay, and Cass counties, which accounted for over 70 percent of the District's growth from 2000 to 2012, are expected to be responsible for more than 90 percent of the growth between 2012 and 2040. Modest population growth often tempers the expansion of non-traded sector businesses that are generally driven by population growth, such as local professional services (legal, accounting, and medical), local retail trade, real estate and financial services, and food service and restaurants.

Freight is an increasingly important factor in sustaining and enhancing the economic competitiveness of businesses in Missouri and in the Kansas City District.

Transportation Dependence: Missouri and the Kansas City District's Economy

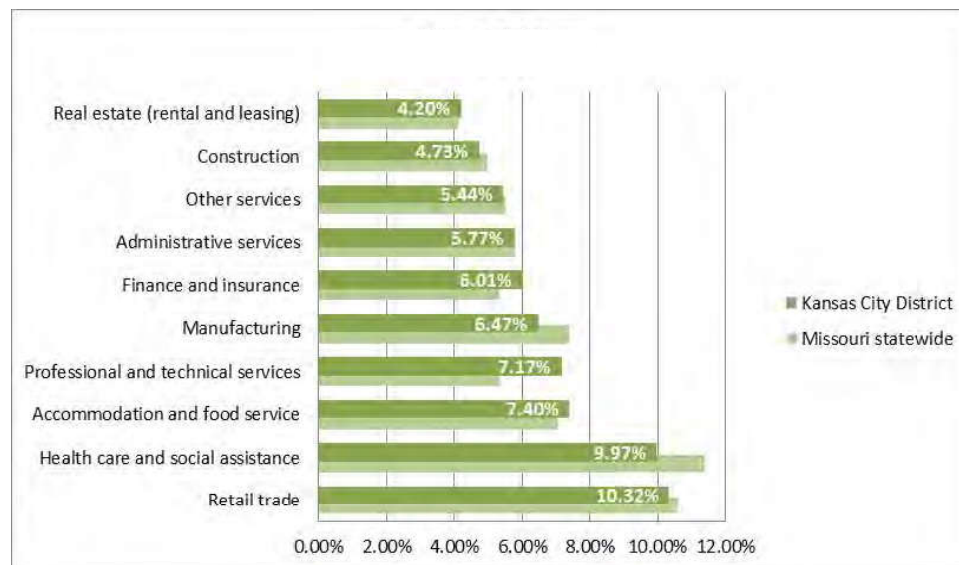
Freight transportation represents a key competitiveness factor for Kansas City District businesses. Companies today compete on more than product quality and cost. The transportation networks serving their facilities must provide reliable connections to buyers and link to a multitude of markets to ensure timely deliveries of goods and services and provide access for employees and customers. Some business sectors use transportation facilities and services more extensively than others. An industry

¹ US Census Intercensal Estimates, July 2000; US Census Annual Estimates; 2013 CEDDS by Woods and Poole Economics

sector's dependence on transportation can be measured by examining the amount a business sector spends on transportation as a share of its total output.² Transportation satellite accounts provide national data regarding the amount spent on transportation per dollar of output for various sectors.

To better understand the role freight and goods movement play in the Kansas City District and the contribution of multimodal transportation to the economic vitality of the region's key industry sectors, the project team evaluated the importance of these key industrial sectors based on the non-government employment concentrations in the District. Almost 70 percent of the District's non-government employment is concentrated in 10 sectors: retail and wholesale trade, health care and social services, accommodation and food service, professional and technical services, finance and insurance, administrative services, other services, construction, and real estate.³ **Figure 1** shows the breakdown of these employment sectors for the Kansas City District, by percentage, and for the State as a whole.

Figure 1: Top Ten Non-Government Employment Sectors for the Kansas City District



As noted in **Figure 1**, the importance of transportation to these key industry sectors can be measured by the amount each sector spent on transportation as a share of its total output.

The project team evaluated several primary industry sectors and identified the corresponding industrial classification codes for each key sector in order to compare the applicable transportation costs per dollar of product output using the transportation satellite accounts research. Key business sectors for the Kansas City District are shown in **Table 1**.

Table 1: North American Industrial Classifications for Key Industrial Sectors in the Kansas City District

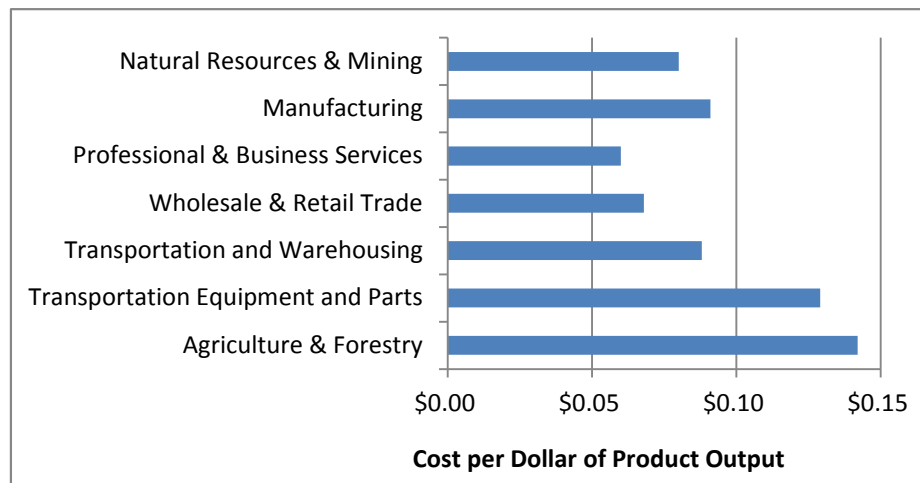
Industrial Sectors	North American Industrial Classification Sector
Transportation Equipment	Manufacturing
Metal Fabrication	Manufacturing
Retail and Wholesale Trade	Retail and Wholesale Trade
Transportation and Warehousing	Transportation and Warehousing
Professional and Technical Services	Professional, Scientific, and Technical Services

² "Transportation Satellite Accounts: A Look at Transportation's Role in the Economy," U.S. DOT Research and Innovative Technology Administration

³ Bureau of Labor Statistics, US Census 2012, County Business Patterns

Figure 2 below shows the transportation cost per dollar of product output for several important existing industry sectors in the Kansas City District based on their North American Industrial Classification System (NAICS) code. Improvements in transportation costs and services would have a significant effect on the profitability of companies in these industries, as lower transportation costs and more reliable service help reduce the cost of materials, resulting in lower overall production costs. Reliable delivery of materials can enhance productivity, and reducing distribution costs to the consumer may also improve competitiveness.

*Figure 2: Transportation Cost as a Share of Sector Output.
(Transportation cost per \$ of product value)*



*Source: Transportation Satellite Accounts database, Bureau of Transportation Statistics,
Research and Innovation Technology Administration*

The Kansas City District has been successful in retaining and attracting transportation-dependent businesses in several significant economic sectors as described in **Table 2**:

Table 2: Economic Sectors the Kansas City District has retained and attracted transportation-dependent businesses

Manufacturing and Advanced Manufacturing	Transportation, Logistics and Freight	Chemical Manufacturing
Ford Motor Company	Walmart	Bayer Crop Science
Harley Davidson	Kohl's	Sanofi-Aventis U.S.
Honeywell	FreightQuote	TNEMEC Company, Inc.
ATK	QC Supply	Silka Corporation
Peterson	O'Reilly Auto Parts	The Valspar Corporation
Maxion Wheels	Ditzfield Transfer	Procter & Gamble

Economic Development Trends

Professional and Technical Services

This sector accounted for 12 percent of the new businesses formed in Missouri in 2013, continuing a three-year growth trend. Much of this growth took place in the metro areas, including the Kansas City District. The sector was responsible for 7.1 percent of all jobs in the Kansas City region in 2011, significantly higher than the 5.3 percent for the state as a whole. This is not surprising given the area's role as a state and regional business and economic center. Twelve Fortune 1000 companies are headquartered in the Kansas City region including H&R Block, Garmin International, Sprint, and Hallmark, and over 50 Fortune 500 companies have a presence here. And the sector is growing: in August 2014 Cerner Corporation announced plans to acquire Siemens Health Systems, and Aspen Contracting in Lee's Summit recently announced plans to add 300 jobs in sales, production, and project management.

Transportation Equipment and Metal Manufacturing

Nearly 6.5 percent of all jobs in the region were in manufacturing. Two manufacturing subsectors, metal fabrication and transportation equipment manufacturing, are particularly significant and continue to expand. Ford announced in 2013 it would expand production to a third shift at its Claycomo plant, adding 900 employees to the production line for F-150 trucks. This follows a \$1.1 billion expansion in 2011 to add 1,600 jobs producing the F-150 pickup and Transit commercial van models. Grupo Antolin, which makes headliners for the Transit van, opened a new manufacturing facility in May 2014, bringing 118 new jobs to the area. Adrian Steel, which makes commercial van interiors, will invest in a new manufacturing facility in Kansas City. Yanfeng USA, a maker of automotive trim and interior components, is building a new \$45 million manufacturing facility in Riverside and LMV Automotive has a new \$42 million production facility in Liberty. Harley-Davidson has a manufacturing plant in Kansas City, and American Performance Technologies makes MotoVox motor scooters and mini bikes in the area. Demand for cars, light trucks, and other vehicles are predicted to remain strong both domestically and internationally as the global economy recovers from the recent recession.

Metal fabrication is the third largest manufacturing employment sector for the State, and it ranks sixth in statewide manufacturing exports.⁴ Employers in the region include Bratton Corporation, which specializes in structural steel fabrication, and R&D Leverage, which employs 275 at its headquarters and tool, die, and molding plant in Lee's Summit. The metal fabrication industry is part of the machine manufacturing sector, which is projected to see overall growth of 6.3 percent in 2014—more than double the 2.9 percent increase seen in 2013—and between five and six percent between 2014 and 2018.⁵

Transportation and Warehousing

Another key business sector for the Kansas City District is transportation and warehousing. The multiple interstates (I-35, I-49, I-70, I-435, I-470, I-635, and I-670) and highways including US-24, US-40, US-50, US-56, US-65, US-69, and US-169 that cross the region make it one of the major trucking hubs in the U.S., and it is the second largest rail hub in the nation in terms of tonnage. Rail access is provided by five Class I rail lines (Burlington Northern Santa Fe, Union Pacific, Canadian Pacific, Norfolk Southern, and Kansas City Southern) as well as regional and short line carriers. Rail is becoming more important as it reduces the number of trucks on increasingly congested roadways. The major railroads all operate intermodal yards, switching yards, transload facilities, and other operations in the Kansas City area. BNSF Railway's new state-of-the-art Logistics Park Kansas City, just across the State line in Edgerton, Kansas, will offer an annual unit capacity of 1.5 million at full build-out and will significantly benefit the Kansas City, Missouri region's freight industry. The Kansas City Port Authority operates a port where the Missouri and Kansas rivers meet that is served by Union Pacific rail. The Kansas City International Airport and multiple Foreign Trade Zones round out the area's freight infrastructure.

Logistics providers Ditzfield Transfer, Exel, FreightQuote, OHL, Murphy Warehouse Co., and Bender Group have located or will locate in the area and Hallmark, Kohl's, Johnson Controls, Inc., Musician's Friend, Toys R Us, Walmart, and O'Reilly Auto Parts have major distribution centers. Trucking companies include Jack Cooper Transit and OrTran Inc. The outlook for the industry is good as investment in transportation and logistics should correlate with growth in the U.S. economy, and the Kansas City District is well-placed to take advantage of increased goods movement resulting from growing national and international demand.

⁴ MERIC Missouri Economic Indicator Brief: Manufacturing Industries, October 2013

⁵ Cassell, Jonathan. IHS Technology. "Rise of the Machines: Industrial Machinery Market Growth to Double in 2014." April 16, 2014

Importance of Freight to the Economic Development Future of the Kansas City District

Manufacturing and Exports

Manufacturing continues to be a vital part of Missouri's economy, and exports of Missouri manufactured goods continue to increase. Missouri businesses exported over \$3 billion in goods by the close of the first quarter of 2014, and nearly \$13 billion in 2013.^{6,7} Four primary industries in the manufacturing sector accounted for over 62 percent of Missouri exports: transportation equipment, chemicals, food and kindred products, and machinery related businesses. These industries exported over \$8 billion in products in 2013.⁸ Agricultural products, fabricated metal products, electrical equipment, minerals and ores, primary metal manufacturing, and computer and electronic products round out the top ten exports from the state in 2013. Over 6,100 businesses in Missouri exported products and services in 2012, and 89.5 percent of Missouri's exports are manufactured goods produced in communities around the State. Manufacturing exports support nearly 107,000 jobs in the state, and 85 percent of the companies engaged in exporting goods and services are small businesses.⁹

Manufacturing matters in Missouri because:

- Employees in manufacturing firms earn an average of \$77,060 annually in pay and benefits, while average workers in all industries earn \$60,168. This means manufacturing jobs pay, on average, 19.9 percent more than non-manufacturing jobs.¹⁰
- Manufacturing firms account for nearly two-thirds of all research and development in the U.S. and are a leading user of new technologies and processes.¹¹
- Manufacturing has the highest multiplier effect of any economic sector. For every dollar spent in manufacturing another \$1.48 is added to the economy, helping to stimulate economic growth.
- Missouri's economy is intrinsically linked to its ability to move people, materials, components, and finished goods within the State and to national and international destinations.
- Missouri's principal trading partners are Canada, Mexico, China, Japan, and Korea.¹² The five industries with the most significant job dependence on exports include grain farming, oilseed farming, wholesale trade, and aircraft manufacturing.
- Export products are intrinsically dependent on multimodal freight transportation.

Conclusion

The Kansas City District has developed a diverse economy, and it is thriving. Major corporations have chosen this location in the center of the U.S. as their headquarters, and many other national firms have a significant presence here. Professional and technical services have been and will remain a significant growth sector, and will help drive population growth from just over six million in 2012 to over 7.1 million by 2040. Manufacturing—led by growth industries such as transportation equipment and component manufacturing and metal fabrication—will also contribute to strong population and economic growth.

Area manufacturers as well as the numerous firms that ship agriculture and food products and other goods by river ports, air, highways, and rail through the Kansas City District depend on a reliable and efficient freight network. The burgeoning transportation, freight, and logistics industry has developed in this strategic location at the heart of the country, and it is ideally situated to handle the increasing freight flows across the country and to and from Canada and Mexico. Strong highway and rail connections link Kansas City with international ports such as Los Angeles and Long Beach, and these will continue to grow in importance as global trade expands.

⁶ WISER Export Trade data, 2014

⁷ U.S. Census Freight Trade State Exports, Missouri

⁸ Missouri Economic Research and Information Center, Missouri Department of Economic Development, March 2013

⁹ U.S. Department of Commerce, International Trade Administration, National Association of Manufacturing, 2013

¹⁰ Bureau of Economic Analysis, Industry Economic Accounts, 2011

¹¹ Brookings Institute, Metropolitan Policy Program, "Why Does Manufacturing Matter?" February 2012

¹² US Census, State Exports, Foreign Trade, 2013

Missouri's annual freight flow is anticipated to grow from more than 600 million tons in 2011 to an astounding one billion tons by 2040, and much of it will travel through the Kansas City District. As freight movement to, from, and within the District continues to increase, its infrastructure must keep pace. Research shows that investment in physical infrastructure reduces costs and improves efficiencies in doing business, boosts job creation, and fosters growth cycles within countries.¹³ Based on this research, maintaining the existing freight network and expanding both its capacity and connectivity in ways that increase reliability and lower transportation costs for producers, shippers, and consumers will be crucial to the future prosperity of the Kansas City District and the State of Missouri.

¹³ Deloitte LLP and the Council on Competitiveness, "2013 Global Manufacturing Competitiveness Index"



NORTHEAST DISTRICT PROFILE: Freight and the District's Economic Future



Global trade and new technologies continue to transform the economy, redefining the way businesses operate, challenging supply chains and transportation networks, and creating new customer opportunities for Missouri businesses in places where they were once inconceivable. Businesses and their employees are more dependent than ever on integrated, agile, and efficient transportation networks to sustain economic competitiveness and facilitate journeys to work and connections to markets.

To compete in this global marketplace, businesses must optimize every asset—workforce skills, competitively priced products, and reliable transportation systems—to ensure their customers receive quality goods and services when they expect them. As the importance of trade and the demands of customers continue to evolve, Missouri companies often find freight an increasingly important factor in sustaining and enhancing their competitive position in the marketplace. Freight supports the domestic and international trade of Missouri businesses, and supports State and local economic development and job growth.

Northeast Missouri Population Trends

Missouri's population is projected to grow, with the 2012 population of 6,021,988 increasing to 7,159,350 by 2040. The modest population growth experienced by MoDOT's Northeast District from 2000 to 2012 is expected to continue, with the 2012 population of 293,204 projected to grow to 331,320 by 2040.¹ Almost three quarters of this growth will occur in Warren and Lincoln Counties, which together are expected to add 34,483 residents between 2012 and 2040. These two counties also saw the greatest growth between 2000 and 2012, with a combined increase of 22,166. Nine of the 17 counties within the District experienced a slight decline in population between 2000 and 2012; between 2012 and 2040 only six Counties (Clark, Knox, Lewis, Monroe, Scotland, and Shelby) are projected to lose population.

Modest population growth often tempers the expansion of non-traded sector businesses that are generally driven by population growth, such as local professional services (legal, accounting, and medical), local retail trade, real estate and financial services, and food service and restaurants.

Freight is an increasingly important factor in sustaining and enhancing the economic competitiveness of businesses in Missouri and in the Northeast District.

Transportation Dependence: Missouri and the Northeast Missouri Economy

Freight transportation represents a key competitiveness factor for Northeast Missouri businesses. Companies today compete on more than product quality and cost. The transportation networks serving their facilities must provide reliable connections to buyers and link to a multitude of markets to ensure timely deliveries of goods and services and provide access for employees and customers. Some business sectors use transportation facilities and services more extensively than others. An industry

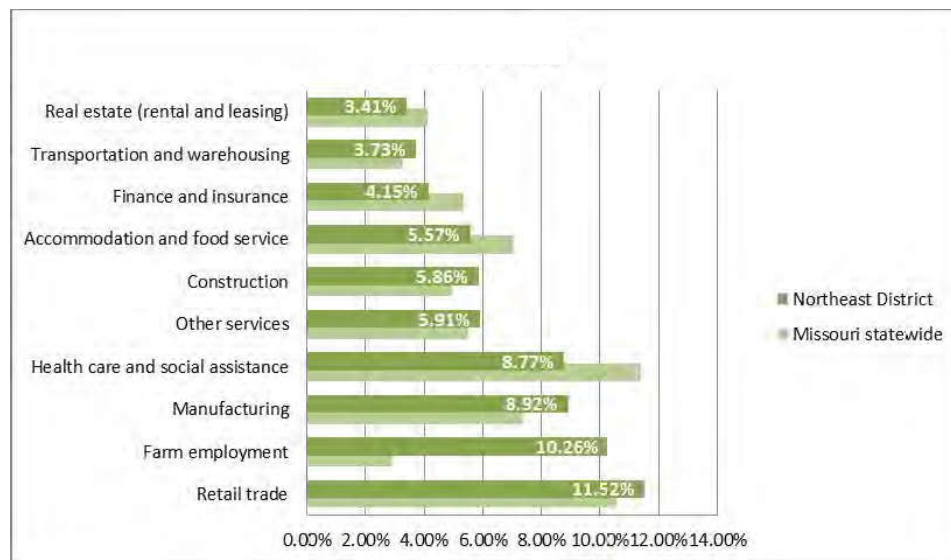
¹ US Census Intercensal Estimates, July 2000; US Census Annual Estimates; 2013 CEDDS by Woods and Poole Economics

Northeast District Profile

sector's dependence on transportation can be measured by examining the amount a business sector spends on transportation as a share of its total output.² Transportation satellite accounts provide national data regarding the amount spent on transportation per dollar of output for various sectors.

To better understand the role freight and goods movement play in the Northeast District and the contribution of multimodal transportation to the economic vitality of the region's key industry sectors, the project team evaluated the importance of these key industrial sectors based on the non-government employment concentrations in the region. More than two-thirds of the Northeast District's non-government employment is concentrated in 10 sectors: retail trade, farm employment, manufacturing, health care and social services, other services, construction, accommodation and food service, finance and insurance, transportation and warehousing, and real estate.³ **Figure 1** shows the breakdown of these employment sectors, by percentage, for the Northeast District and for the State.

Figure 1: Top Ten Non-Government Employment Sectors, Northeast District



As noted in **Figure 1**, the importance of transportation to these key industry sectors can be measured by the amount each sector spent on transportation as a share of its total output. The project team evaluated several primary industry sectors and identified the corresponding industrial classification codes for each key sector in order to compare the applicable transportation costs per dollar of product output using the transportation satellite accounts research. Key business sectors for the Northeast District are shown in **Table 1**.

Table 1: North American Industrial Classifications for Key Industrial Sectors, Northeast District

Industrial Sectors	North American Industrial Classification Sector
Agribusiness, Food Processing, Food Technology	Agriculture
Machine Manufacturing	Manufacturing
Chemicals and Chemical Based Products	Manufacturing
Retail and Wholesale Trade	Retail and Wholesale Trade
Health Care and Social Services	Health Care and Social Assistance
Electrical Equipment, Component Manufacturing	Manufacturing

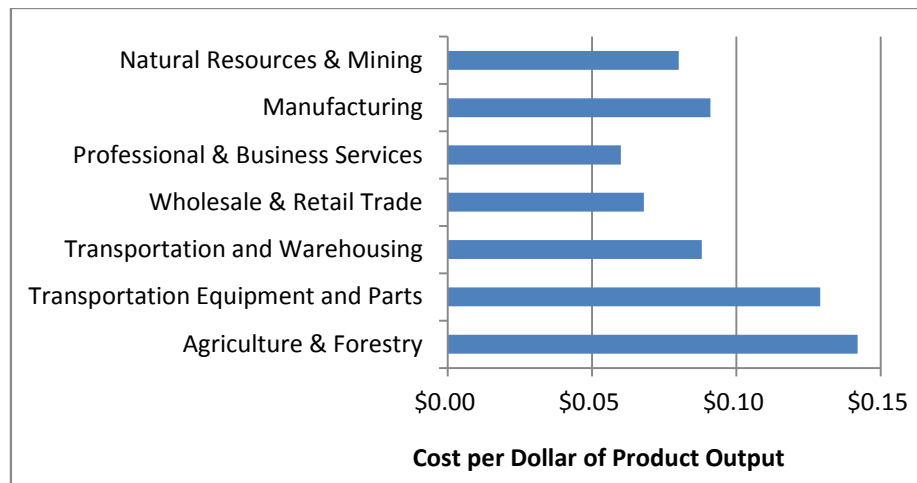
² "Transportation Satellite Accounts: A Look at Transportation's Role in the Economy," U.S. DOT Research and Innovative Technology Administration

³ Bureau of Labor Statistics, US Census 2012, County Business Patterns

Northeast District Profile

Figure 2 below shows the transportation cost per dollar of product output for several important existing industry sectors in Northeast Missouri based on their NAICS code. Improvements in transportation costs and services would have a significant effect on the profitability of companies in these industries, as lower transportation costs and more reliable service help reduce the cost of materials, resulting in lower overall production costs. Reliable delivery of materials can enhance productivity, and reducing distribution costs to the consumer may also improve competitiveness.

*Figure 2: Transportation Cost as a Share of Sector Output.
(Transportation cost per \$ of product value)*



*Source: Transportation Satellite Accounts database, Bureau of Transportation Statistics,
Research and Innovation Technology Administration*

The Northeast District has been successful in retaining and attracting transportation-dependent businesses in several significant economic sectors as described in **Table 2**:

Table 2: Economic Sectors the Northeast District has retained and attracted transportation-dependent businesses

Manufacturing and Advanced Manufacturing	Agriculture and Food Processing	Transportation, Logistics and Freight (distribution centers)
SunEdison	General Mills	Brookstone
CertainTeed	Con Agra	Home Depot
Hercules, Inc.	Kraft Foods Group	Walmart
Watlow Missouri	Tyson Foods	Hartzell Hardwoods

Northeast District Profile

Economic Development Trends

Marion County has the highest number of business startups in the Northeast District, and two Counties—Audrain and Scotland—more than doubled their number of startup businesses in 2013 compared to 2012. Hannibal is the largest employment center; roughly 25 percent of the region's District's residents worked there in 2009. However, small businesses (defined as those employing fewer than 100 workers) play a major role in the economy of the Northeast District. In 2013 the National Establishment Time Series, or NETS, which is based on Dun & Bradstreet data, reported that 99 percent of all establishments in the District were small businesses. According to the same source, between 2003 and 2013 small establishments accounted for the most new businesses, with a net gain of 1,605, while medium and large establishments combined decreased by nine. Small businesses added 6,276 jobs during the same period, or about 75 percent of all new jobs in the District. Medium and large establishments lost 5,499 jobs, resulting in a total of 776 net new jobs for the District from 2003 to 2013.⁴

Agribusiness, Food Processing, and Food Technology

Agriculture, food processing, and food technology make up a strong industry cluster in the Northeast District. This sector employed 2,777 in 2013, an increase of 197 jobs since 2006. Soybeans and corn are the major crops, and in recent years both have benefited from increased foreign demand. Ethanol and biodiesel remain important industries, though they have not yet generated the profits anticipated prior to the recent recession. The University of Missouri Food and Agricultural Policy Research Institute expects both corn and soybean prices to drop over the next five years due to record high yields. Net farm income was higher in 2013 than at any time since the 1970s, but global production of grains and oilseeds exceeded consumption and stocks increased. Animal producers are five times more concentrated in the Northeast region than in the U.S. as a whole, and both livestock and milk prices have remained relatively strong. Food manufacturing was the top manufacturing employment sector in the State in 2013 for the fourth consecutive year, with 39,747 jobs. International agribusiness producers such as Con Agra in Macon, Kraft Foods in Kirksville, and General Mills in Hannibal are significant employers in the District.

Machine Manufacturing

Machinery manufacturing is also strong in the Northeast District; employment grew by 14 percent per year from 2003 to 2007, compared to only 1.5 percent for the U.S. as a whole. Employment declined in 2008 with the global recession but has begun to rebound, and is expected to grow by 3.39 percent between 2012 and 2022.⁵ The sector was Missouri's third largest foreign export segment in 2009 and 2010, and exports to other states are also substantial. Scotland and Ralls Counties have significant employment in machine manufacturing in businesses such as Watlow Industries in Hannibal, which manufactures industrial thermal systems; Bodine Aluminum in Troy, which makes parts for Toyota; Dura Automotive Systems in Moberly; Orscheln Products LLC, also in Moberly, makers of transportation motion control systems; and SAF-Holland USA Inc., which manufactures coupling, lifting, and suspension systems for commercial vehicles.

Electrical Equipment and Component Manufacturing

Manufacturing of electrical equipment and components is another key sector. Charles Industries in Canton, manufacturers of communications and power enclosures and marine and industrial equipment, is an important employer in the region. As the global economy recovers, analysts expect "quite impressive" growth in the worldwide market for industrial machinery and equipment between 2014 and 2018,⁶ driven by consumer products such as cars and food as well as oil and gas exploration, construction, and green energy. Annual U.S. growth is projected to be 6.3 percent in 2014 (more than double the 2.9 percent increase seen in 2013) and growth should average between five and six percent between 2014 and 2018.

Chemicals and Chemical-Based Products

Chemical products represent another important employment sector in the Northeast District, and wages are higher than average. The average annual wage for skilled machine operators and inspectors ranges from \$30,000 to \$36,000, and chemists make over \$65,000.⁷ This industry has the potential to increase incomes in the region, which averaged only \$28,266 in 2008—well below the state average of \$40,710. Providing the appropriate training will be key, however. Major employers include BASF, which produces agricultural chemical products in Palmyra; and Hercules, Inc. a manufacturer of fertilizer, industrial organic chemicals, and paint products in Louisiana. Chemicals were Missouri's second largest foreign export in 2009 at \$1.9 billion and demand is expected to remain strong in the agriculture and automotive areas, with demand for chemicals related to the construction industry picking up somewhat as well.⁸

⁴ Youreconomy.org, developed by the Edward Lowe Foundation

⁵ www.missourieconomy.org, Industry Employment Projections by Region

⁶ Jonathan Cassell, IHS Technology, "Rise of the Machines: Industrial Machinery Market Growth to Double in 2014," April 16, 2014.

⁷ MERIC Pattern Industry Insights: Chemical Manufacturing

⁸ NASDAQ.com, "Chemical Industry Stays the Course" by Zacks.com, August 12, 2014.

Northeast District Profile

Transportation equipment, chemicals, and machinery were the three top Missouri exports to Canada in 2013. Canada is already the largest importer of Missouri goods, and trade discussions with several Canadian provinces in 2014 point to increases in exports of Missouri products. The State has signed trade agreements with Quebec, Korea, Taiwan, China, Brazil, and several European countries to sell \$9.7 billion in Missouri products over the next four years, according to the Governor's office.

Wholesale and Retail Trade

Job opportunities in wholesale and retail trade are expected to be above average between 2012 and 2022. MERIC forecasts a 4.5 percent increase in wholesale employment and a 4.07 percent increase in retail employment for the region, for a total of 571 new jobs.⁹ Though internet sales will continue to compete with brick-and-mortar stores, both depend on efficient freight transportation to get their products in the hands of consumers. Overall growth is anticipated in both wholesale and retail trade in the next few years as the country and the world recover from the recent global recession.

Importance of Freight to the Economic Development Future of the Northeast District

Manufacturing and Exports

Manufacturing continues to be a vital part of Missouri's economy and exports of Missouri manufactured goods continue to increase. Missouri businesses exported over \$3 billion in goods by the close of the first quarter of 2014, and nearly \$13 billion in 2013.^{10,11} Four primary industries in the manufacturing sector accounted for over 62 percent of Missouri exports: transportation equipment, chemicals, food and kindred products, and machinery related businesses. These industries exported over \$8 billion in products in 2013.¹² Agricultural products, fabricated metal products, electrical equipment, minerals and ores, primary metal manufacturing, and computer and electronic products round out the top ten exports from the State in 2013. Over 6,100 businesses in Missouri exported products and services in 2012, and 89.5 percent of Missouri's exports are manufactured goods produced in communities around the State. Manufacturing exports support nearly 107,000 jobs in the State, and 85 percent of the companies engaged in exporting goods and services are small businesses.¹³

Manufacturing matters in Missouri because:

- Employees in manufacturing firms earn an average of \$77,060 annually in pay and benefits, while average workers in all industries earn \$60,168. This means manufacturing jobs pay, on average, 19.9 percent more than non-manufacturing jobs.¹⁴
- Manufacturing firms account for nearly two-thirds of all research and development in the U.S. and are a leading user of new technologies and processes.¹⁵
- Manufacturing has the highest multiplier effect of any economic sector. For every dollar spent in manufacturing another \$1.48 is added to the economy, helping to stimulate economic growth.
- Missouri's economy is intrinsically linked to its ability to move people, materials, components, and finished goods within the State and to national and international destinations.
- Missouri's principal trading partners are Canada, Mexico, China, Japan, and Korea.¹⁶ The industries most dependent on exports include grain farming, oilseed farming, wholesale trade, and aircraft manufacturing. Agriculture continues to play a significant role in the Northeast District's economy. Food manufacturers benefit from the proximity of farms to produce crops, and many crop farmers produce feedstock for nearby animal producers. Retailers and wholesalers of farm-related products benefit by locating near producers, and firms providing trucking, rail, and Mississippi River port services provide key linkages.
- Export products are intrinsically dependent on multimodal freight transportation.

⁹ MERIC Industry Employment Projections by Region, accessed at www.missourieconomy.org

¹⁰ WISER Export Trade data, 2014

¹¹ U.S. Census Freight Trade State Exports, Missouri

¹² Missouri Economic Research and Information Center, Missouri Department of Economic Development, March 2013

¹³ U.S. Department of Commerce, International Trade Administration, National Association of Manufacturing, 2013

¹⁴ Bureau of Economic Analysis, Industry Economic Accounts, 2011

¹⁵ Brookings Institute, Metropolitan Policy Program, "Why Does Manufacturing Matter?" February 2012

¹⁶ US Census, State Exports, Foreign Trade, 2013

Northeast District Profile

Conclusion

The economy of MoDOT's Northeast District depends in large part on agriculture and food processing, manufacturing, and wholesale and retail trade. Farming ranks second in employment for the District, accounting for over ten percent of all jobs. Corn, soybeans, and animal products are key items, and demand for these both within the U.S. and internationally should remain strong. Food processing giants Con-Agra, Kraft Foods, General Mills, and Tyson Foods are major employers, and exports of food products to established trade partners such as Canada, Mexico, China, Taiwan, and Korea are also predicted to grow.

Manufacturing ranks third in jobs for the Northeast District, and as noted previously these jobs are vital as they offer above-average wages. The outlook is positive for both domestic and foreign markets for machinery, transportation components, electrical equipment, and chemicals, which represent the significant manufacturing industries in the region. Retail and wholesale trade is the top source of employment in the Northeast District, and the predicted population growth, especially in Warren and Lincoln Counties, will contribute to growth in this sector. National brands such as Walmart, Home Depot, and Brookstone have already built major distribution centers in the District, and Hartzell Hardwoods, a leading producer of hardwood lumber, is expanding its warehouse facility in Kirskville.

All of these industries depend on a dependable, efficient freight network. Major highways such as I-70 and US-61, US-63, and US-36 link the region's producers to the rest of the nation, and the many secondary roads that cross the district enable businesses and farms to send their products to suppliers and markets. These roads are also crucial for deliveries to businesses and homes in the rural areas that make up most of the region. Ports along the Mississippi River play a critical role in moving goods to international shipping destinations, and rail infrastructure is important as well. Research has shown that investing in physical infrastructure reduces costs and improves efficiencies in conducting business, boosts job creation, and fosters growth cycles within countries.¹⁷ Based on this research, maintaining the region's existing freight infrastructure and expanding both capacity and connections in ways that increase reliability and reduce costs are essential to the economic vitality of the businesses and residents of the Northeast District.

¹⁷ Deloitte LLP and the Council on Competitiveness, "2013 Global Manufacturing Competitiveness Index"

NORTHWEST DISTRICT PROFILE: Freight and the District's Economic Future



Global trade and new technologies continue to transform the economy, redefining the way businesses operate, challenging supply chains and transportation networks, and creating new customer opportunities for Missouri businesses in places where they were once inconceivable. Businesses and their employees are more dependent than ever on integrated, agile, and efficient transportation networks to sustain economic competitiveness and facilitate journeys to work and connections to markets.

To compete in this global marketplace, businesses must optimize every asset—workforce skills, competitively priced products, and reliable transportation systems—to ensure their customers receive quality goods and services when they expect them. As the importance of trade and the demands of customers continue to evolve, Missouri companies often find freight an increasingly important factor in sustaining and enhancing their competitive position in the marketplace. Freight supports the domestic and international trade of Missouri businesses, and supports State and local economic development and job growth.

Northwest Missouri Population Trends

Missouri's population is projected to grow, with the 2012 population of 6,021,988 increasing to 7,159,350 by 2040. The slight population growth experienced by the MoDOT Northwest Missouri District from 2000 to 2012 is expected to continue, with the 2012 population of 278,930 projected to grow to 286,150 by 2040.¹ Thirteen of the 20 counties within the District experienced a decline in population between 2000 and 2012, and between 2012 and 2040 nine counties are projected to see a decrease in population.

Andrew, Buchanan, Caldwell, Clinton, Daviess, Livingston, and Nodaway counties experienced growth in population from 2000 to 2012, but the population of these counties increased by only 8,322 during this period. Modest population growth often tempers the expansion of non-traded sector businesses that are generally driven by population growth, such as local professional services (legal, accounting, and medical), local retail trade, real estate and financial services, and food service and restaurants.

Freight is an increasingly important factor in sustaining and enhancing the economic competitiveness of businesses in Missouri and in the Northwest District.

Transportation Dependence: Missouri and the Northwest Missouri Economy

Freight transportation represents a key competitiveness factor for northwest Missouri businesses. Companies today compete on more than product quality and cost. The transportation networks serving their facilities must provide reliable connections to buyers and link to a multitude of markets to ensure timely deliveries of goods and services and provide access for employees and customers. Some business sectors use transportation facilities and services more extensively than others. An industry sector's dependence on transportation can be measured by examining the amount a business sector spends on transportation

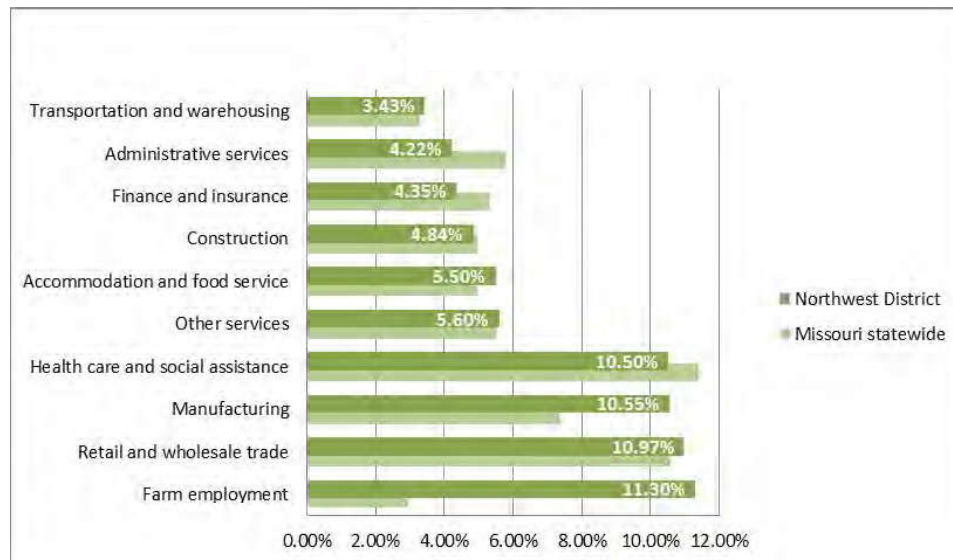
¹ US Census Intercensal Estimates, July 2000; US Census Annual Estimates; 2013 CEDDS by Woods and Poole Economics

Northwest District Profile

as a share of its total output.² Transportation satellite accounts provide national data regarding the amount spent on transportation per dollar of output for various sectors.

To better understand the role freight and goods movement play in northwest Missouri and the contribution of multimodal transportation to the economic vitality of the region's key industry sectors, the project team evaluated the importance of these key industrial sectors based on the non-government employment concentrations in the region. Over 70 percent of the District's non-government employment is concentrated in 10 sectors: farm employment, retail and wholesale trade, manufacturing, health care and social services, other services, accommodation and food service, construction, finance and insurance, administrative services, and transportation and warehousing.³ Figure 1 shows the breakdown of these employment sectors for the Northwest District, by percentage, and for the State of Missouri.

Figure 1: Top Ten Non-Government Employment Sectors, Northwest District



As noted in Figure 1, the importance of transportation to these key industry sectors can be measured by the amount each sector spent on transportation as a share of its total output.

The project team evaluated several primary industry sectors and identified the corresponding industrial classification codes for each key sector in order to compare the applicable transportation costs per dollar of product output using the transportation satellite accounts research. Key business sectors for the Northwest District are shown in Table 1.

Table 1: North American Industrial Classifications for Key Industrial Sectors, Northwest District

Industrial Sectors	North American Industrial Classification Sector
Agriculture and Food Processing	Agriculture
Chemical Manufacturing	Manufacturing
Fabricated Metal Manufacturing	Manufacturing
Animal Production	Agriculture

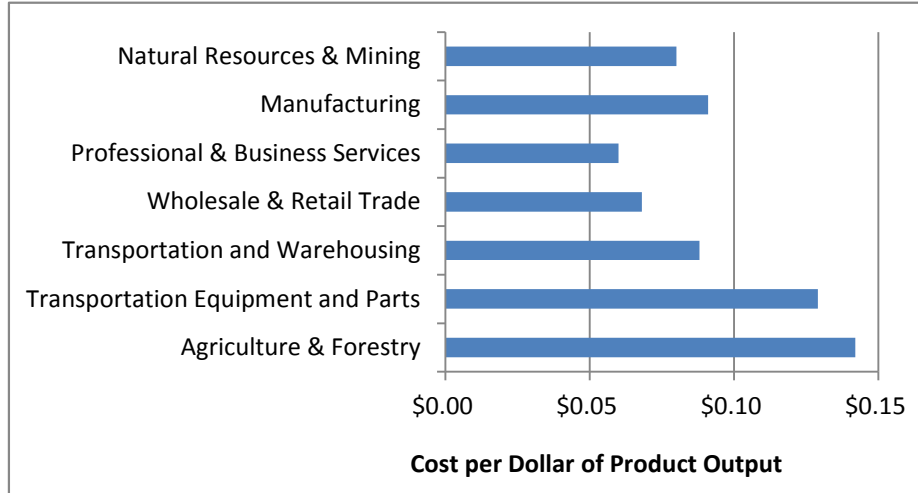
² "Transportation Satellite Accounts: A Look at Transportation's Role in the Economy," U.S. DOT Research and Innovative Technology Administration

³ Bureau of Labor Statistics, US Census 2012, County Business Patterns

Northwest District Profile

Figure 2 shows the transportation cost per dollar of product output for several important existing industry sectors in the Northwest District based on their NAICS code. Improvements in transportation costs and services would have a significant effect on the profitability of companies in these industries, as lower transportation costs and more reliable service help reduce the cost of materials, resulting in lower overall production costs. Reliable delivery of materials can enhance productivity, and reducing distribution costs to the consumer may also improve competitiveness.

Figure 2: Transportation Cost as a Share of Sector Output.



*Source: Transportation Satellite Accounts database, Bureau of Transportation Statistics
Research and Innovation Technology Administration*

The Northwest District has been successful in retaining and attracting transportation-dependent businesses in several significant economic sectors as described in **Table 2**:

Table 2: Economic Sectors the Northwest District has retained and attracted transportation-dependent businesses

Agriculture and Food Processing		Chemical Manufacturing	
Hillshire Brands		Albaugh, Inc.	
LifeLine Foods		HPI Products, Inc.	
AG Processing Inc.		Boehringer Ingelheim Vetmedica Inc.	
Triumph Foods			
ConAgra			

Northwest District Profile

Economic Development Trends

The Northwest District accounts for 3.0 percent of State's population. About 47 percent of residents work in St. Joseph, the District's economic center, and another 8.0 percent are employed in Maryville, where Northwest Missouri State University is a major employer. Just under 6.0 percent commute to Kansas City.

Agriculture and Food Processing

Agriculture and food processing is a key economic sector for the Northwest District. In the first quarter of 2014 the District had 38 food manufacturing firms employing 5,861 workers, a slight increase (1.7 percent) over the previous year. More than 10,000 area residents were either farm owners or farm workers in 2007, though many held down other jobs in addition to farming. Firms in the District include LifeLine Foods, based in St. Joseph, which manufactures ethanol-based food ingredients and food packaging, along with ConAgra, Danisco, AG Processing, and Ventura Foods.

The State is third in the production of beef cattle, seventh in turkeys, eighth for hogs and pigs, and seventh for milk cows, and Missouri ranks sixth in the U.S. in pork exports and tenth for beef exports. Animal production is a key sector in the Northwest District, thanks in large part to its location in the center of four states that produce animal feedstocks: Missouri, Kansas, Nebraska, and Iowa. The District is also part of the animal health corridor that runs from Columbia, Missouri to Manhattan, Kansas and includes leading universities and private companies involved in animal nutrition and health science and research. Area firms in this sector include Triumph Foods, with headquarters in St. Joseph, one of the top pork processors in the U.S. and a leading exporter of pork products; and Hillshire Brands, also based in St. Joseph, which includes Ball Park Franks, Jimmy Dean sausage products, Sara Lee bakery goods, and Hillshire Farms meats. Hillshire Brands merged with Tyson Foods in August 2014. The combined company will have over \$40 billion in annual sales. Demand for U.S. agricultural and food products is expected to remain strong as global populations increase and consumers in other countries seek the quality products made here.

Chemical Manufacturing

Chemical manufacturing is another strong sector in the Northwest District, and chemical industry workers command among the highest wages in the area, averaging more than \$58,000 in 2008. Furthermore, chemical manufacturing has direct and indirect impacts in the economy. For every 100 new workers hired, an additional 429 related jobs are created. The value-added benefit per worker in chemical manufacturing and its supporting industries is \$130,738.⁴ In 2008 the Northwest region had more than 1,300 chemical manufacturing employees. Albaugh, Inc. in St. Joseph produces herbicides, fungicides, insecticides, and plant growth regulators, and HPI Products, also in St. Joseph, manufactures lawn and garden supplies, herbicides, pesticides, and other agrochemical products. Also in St. Joseph, Boehringer Ingelheim Vetmedica Inc., which recently invested \$160 million in its facility, develops vaccines and pest control products for cattle, swine, and horses as well as the pet industry. Nestle Purina Petcare has two facilities in St. Joseph that together employ 250 workers. Its product technology center is the global research and development headquarters for Friskies pet food, and a pilot production plant shares the site. Biozyme Inc. is an innovator in animal nutrition and microbiology, producing vitamin, mineral, and protein supplements.

Chemicals are the state's second largest export to other countries, and exports to other states are also significant. Top export partners for Missouri agricultural chemicals in 2009 were Belgium, Brazil, the U.K., China, India, Canada, Mexico, Colombia, Korea, and Australia. As with food products, global demand for agricultural chemicals is forecast to strengthen in coming years and producers in the Northwest District will benefit from this growth.

Fabricated Metal Manufacturing

Though employment in fabricated metal manufacturing declined somewhat during the recent recession, it remains a significant industry in Missouri, representing the State's third largest manufacturing employment sector. The industry is important for the Northwest District as well. Most of the area's metal manufacturing firms are mid-sized and produce customized metal products. WireCo WorldGroup in St. Joseph manufactures and distributes wire, wire rope, and electromechanical cable. Perka Building Frames makes steel building structures and trusses for agricultural, industrial, commercial, and residential use, and Varco Pruden Buildings designs and manufactures pre-engineered steel nonresidential buildings. Silgan Containers is the largest provider of metal food packaging in the U.S., and Snorkel is a leading global manufacturer of aerial lifts and work platforms. Fabricated metal products were the State's sixth largest manufacturing export in 2012 and both domestic and international sales should remain strong. The fabrication industry is part of the machine manufacturing sector, which is projected to see overall growth of 6.3 percent in 2014—more than double the 2.9 percent increase of 2013—and between 5.0 and 6.0 percent growth is expected between 2014 and 2018.⁵

⁴ MERIC Pattern Analysis: Northwest Region, December 2010

⁵ Cassell, Jonathan. IHS Technology. "Rise of the Machines: Industrial Machinery Market to Double in 2014." April 16, 2014

Northwest District Profile

Importance of Freight to the Economic Development Future of the Northwest District

Manufacturing and Exports

Manufacturing continues to be a vital part of Missouri's economy and exports of Missouri manufactured goods continue to increase. Missouri businesses exported over \$3 billion in goods by the close of the first quarter of 2014, and nearly \$13 billion in 2013.^{6,7} Four primary industries in the manufacturing sector accounted for over 62 percent of Missouri exports: transportation equipment, chemicals, food and kindred products, and machinery related businesses. These industries exported over \$8 billion in products in 2013.⁸ Agricultural products, fabricated metal products, electrical equipment, minerals and ores, primary metal manufacturing, and computer and electronic products round out the top 10 exports from the state in 2013. Over 6,100 businesses in Missouri exported products and services in 2012, and 89.5 percent of Missouri's exports are manufactured goods produced in communities around the State. Manufacturing exports support nearly 107,000 jobs in the State, and 85 percent of the companies engaged in exporting goods and services are small businesses.⁹

Manufacturing matters in Missouri because:

- Employees in manufacturing firms earn an average of \$77,060 annually in pay and benefits, while average workers in all industries earn \$60,168. This means manufacturing jobs pay, on average, 19.9 percent more than non-manufacturing jobs.¹⁰
- Manufacturing firms account for nearly two-thirds of all research and development in the U.S. and are a leading user of new technologies and processes.¹¹
- Manufacturing has the highest multiplier effect of any economic sector; for every dollar spent in manufacturing another \$1.48 is added to the economy, helping to stimulate economic growth.
- Missouri's economy is intrinsically linked to its ability to move people, materials, components, and finished goods within the state and to national and international destinations.
- Missouri's principal trading partners are Canada, Mexico, China, Japan, and Korea.¹² The five industries with the most significant job dependence on exports include grain farming, oilseed farming, wholesale trade, and aircraft manufacturing.
- Export products are intrinsically dependent on multimodal freight transportation.

Conclusion

The Northwest District, particularly St. Joseph, its economic and commercial center, is home to a number of international firms as well as innovative startups. St. Joseph was named one of the Best Cities for Job Growth by New Geography. It was also listed in Area Development magazine's 100 Leading Locations: Desirable Places for Doing Business in the spring of 2011. The economy of the Northwest District is heavily dependent on the manufacturing sector, with strong clusters in agriculture and food processing, animal production and animal care and nutrition, chemical manufacturing, and fabricated metal manufacturing. These industries are all among Missouri's top manufacturing exports, and are expected to see growth in the next decade.

But the success of the District's manufacturing sector, and thus its economic vitality, depends on a reliable and efficient freight network. Manufacturers depend on the freight system to deliver raw material and components and carry finished products to assembly plants, distributors, and end users. Farms rely on state highways and secondary roads to transport their output to markets and consumers, and businesses rely on these routes for time-sensitive deliveries. Research shows that investment in physical infrastructure reduces costs and improves efficiencies in conducting business, boosts job creation, and fosters growth cycles within countries.¹³ Based on the research, maintaining the District's existing freight infrastructure and expanding both its

⁶ WISER Export Trade data, 2014

⁷ U.S. Census Freight Trade State Exports, Missouri

⁸ MERIC, Missouri Department of Economic Development, March 2013

⁹ U.S. Department of Commerce, International Trade Administration, National Association of Manufacturing, 2013

¹⁰ Bureau of Economic Analysis, Industry Economic Accounts, 2011

¹¹ Brookings Institute, Metropolitan Policy Program, "Why Does Manufacturing Matter?" February 2012

¹² US Census, State Exports, Foreign Trade, 2013

¹³ Deloitte LLP and the Council on Competitiveness, "2013 Global Manufacturing Competitiveness Index"

Northwest District Profile

capacity and connectivity in ways that increase reliability and reduce transportation costs are critical to the economic prosperity of the businesses and residents of the Northwest District.

SOUTHEAST DISTRICT PROFILE: Freight and the District's Economic Future



Global trade and new technologies continue to transform the economy, redefining the way businesses operate, challenging supply chains and transportation networks, and creating new customer opportunities for Missouri businesses in places where they were once inconceivable. Businesses and their employees are more dependent than ever on integrated, agile, and efficient transportation networks to sustain economic competitiveness and facilitate journeys to work and connections to markets.

To compete in this global marketplace, businesses must optimize every asset—workforce skills, competitively priced products, and reliable transportation systems—to ensure their customers receive quality goods and services when they expect them. As the importance of trade and the demands of customers continue to evolve, Missouri companies often find freight an increasingly important factor in sustaining and enhancing their competitive position in the marketplace. Freight supports the domestic and international trade of Missouri businesses, and supports State and local economic development and job growth.

Southeast Missouri Population Trends

Missouri's population is projected to grow, with the 2012 population of 6,021,988 increasing to 7,159,350 by 2040. The modest population growth experienced by the MoDOT Southeast District from 2000 to 2012 is expected to continue, with the 2012 population of 577,499 projected to grow to 661,290 by 2040.¹ Several of the 25 counties within the District experienced a decline in population between 2000 and 2012, including Dunklin, Iron, New Madrid, Pemiscot, Reynolds, Scott, Shannon, and Sainte Genevieve Counties. Between 2012 and 2040 four counties are projected to lose population: Mississippi, New Madrid, Pemiscot, and Reynolds Counties.

Cape Girardeau, Texas, and Howell Counties experienced the greatest growth in population from 2000 to 2012, but the population of the three counties increased by only 14,259 during this period. Modest population growth often tempers the expansion of non-traded sector businesses that are generally driven by population growth, such as local professional services (legal, accounting, and medical), local retail trade, real estate and financial services, and food service and restaurants.

Freight is an increasingly important factor in sustaining and enhancing the economic competitiveness of businesses in Missouri and in the Southeast District.

Transportation Dependence: Missouri and the Southeast District Economy

Freight transportation represents a key competitiveness factor for Southeast District businesses. Companies today compete on more than product quality and cost. The transportation networks serving their facilities must provide reliable connections to buyers and link to a multitude of markets to ensure timely deliveries of goods and services and provide access for employees and customers. Some business sectors use transportation facilities and services more extensively than others. An industry sector's dependence on transportation can be measured by examining the amount a business sector spends on transportation

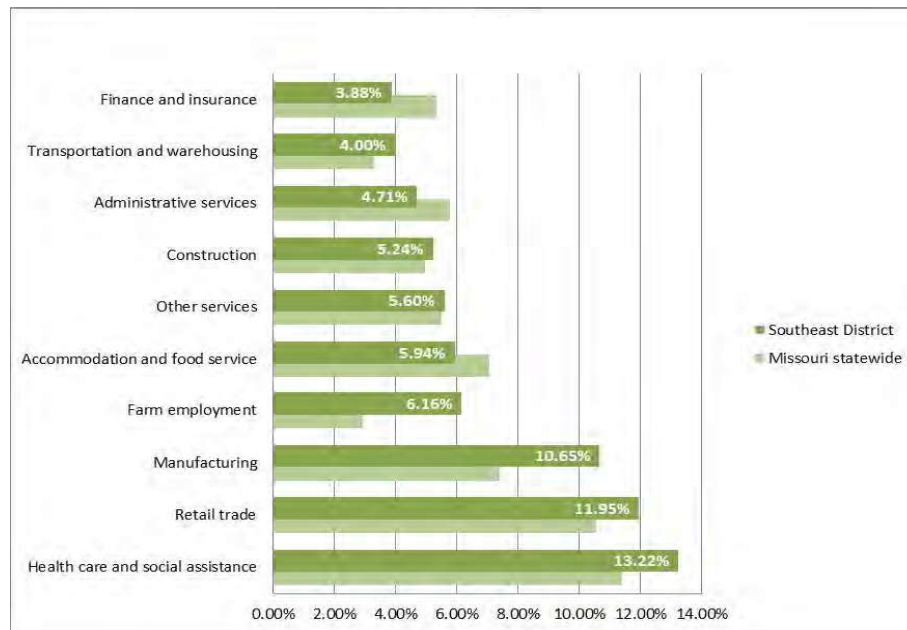
¹ US Census Intercensal Estimates, July 2000; US Census Annual Estimates; 2013 CEDDS by Woods and Poole Economics

Southeast District Profile

as a share of its total output.² Transportation satellite accounts provide national data regarding the amount spent on transportation per dollar of output for various sectors.

To better understand the role freight and goods movement play in the Southeast District and the contribution of multimodal transportation to the economic vitality of the District's key industry sectors, the project team evaluated the importance of these key industrial sectors based on the non-government employment concentrations in the District. Almost 75 percent of the District's non-government employment is concentrated in 10 sectors: health care and social services, retail and wholesale trade, manufacturing, accommodation and food service, other services, administrative services, finance and insurance, construction, transportation and warehousing, and farm employment.³ Figure 1 shows the breakdown of these employment sectors, by percentage, for the Southeast District and for the State of Missouri.

Figure 1: Top Ten Non-Government Employment Sectors, Southeast District



As noted in Figure 1, the importance of transportation to these key industry sectors can be measured by the amount each sector spent on transportation as a share of its total output.

The project team evaluated several primary industry sectors and identified the corresponding industrial classification codes for each key sector in order to compare the applicable transportation costs per dollar of product output using the transportation satellite accounts research. Key business sectors for the Southeast District are shown in Table 1.

Table 1: North American Industrial Classifications for Key Industrial Sectors, Southeast District

Industrial Sectors	North American Industrial Classification Sector
Vineyards and Wineries	Agriculture
Cargo-Oriented Development	Transportation and Warehousing
Plastics and Rubber Products	Manufacturing
Machine Manufacturing	Manufacturing
Retail and Wholesale Trade	Retail and Wholesale Trade
Agriculture and Forestry	Agriculture

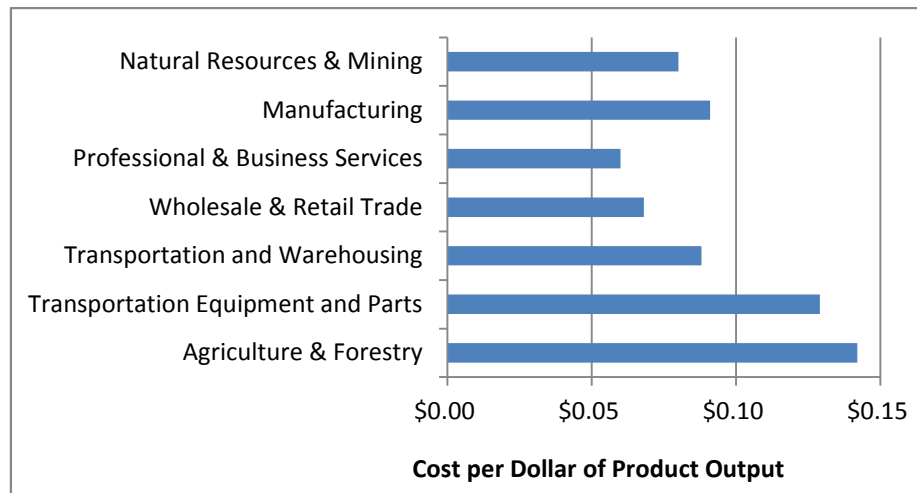
² "Transportation Satellite Accounts: A Look at Transportation's Role in the Economy," U.S. DOT Research and Innovative Technology Administration

³ Bureau of Labor Statistics, US Census 2012, County Business Patterns

Southeast District Profile

Figure 2 shows the transportation cost per dollar of product output for several important existing industry sectors in the Southeast District based on their NAICS code. Improvements in transportation costs and services would have a significant effect on the profitability of companies in these industries, as lower transportation costs and more reliable service help reduce the cost of materials, resulting in lower overall production costs. Reliable delivery of materials can enhance productivity, and reducing distribution costs to the consumer may also improve competitiveness.

*Figure 2: Transportation Cost as a Share of Sector Output.
(Transportation cost per \$ of product value)*



*Source: Transportation Satellite Accounts database, Bureau of Transportation Statistics,
Research and Innovation Technology Administration*

The Southeast District has been successful in retaining and attracting transportation-dependent businesses in several significant economic sectors as described in **Table 2**:

Table 2: Economic Sectors the Southeast District has retained and attracted transportation-dependent businesses:

Advanced Manufacturing	Machine Manufacturing	Chemical Manufacturing
Invensys Controls	Nordyne	Royal Oak Enterprises
SRG Global	Briggs & Stratton	Spectrum Brands
Noranda Aluminum	Ellington Industrial Supply	Mondi Jackson Inc.
TG Missouri		Procter & Gamble

Southeast District Profile

Economic Development Trends

The Missouri Economic Research and Information Center (MERIC) reported the statewide average rate for the formation of new businesses increased by 0.1 percent in 2013, to 2.8 percent new businesses per 1,000 residents.⁴ The counties in the MERIC Southeast and South Central region, which includes most of the MoDOT Southeast District, continued to lead the State in this metric. In particular, MERIC's Southeast region had a higher share of startups in manufacturing and in transportation and warehousing businesses than other parts of the State.

Cargo-Oriented Development

MERIC also predicts strong job openings in freight-related occupations in the state between 2012 and 2022.⁵ Heavy and tractor-trailer truck drivers are expected to account for 1,475 job openings and 1,757 openings are anticipated for freight, stock, and material movers. Both of these figures include growth as well as replacement positions due to retirement, turnover, and workers shifting to other industries. Transportation and warehousing is listed as a top industry for employment in the Southeast District between 2011 and 2040, with projected job growth of 40.6 percent.⁶ However, as of August 2014 a nationwide shortage of truck drivers means as many as 40,000 openings are not being filled. Truck drivers are third on the list of ManpowerGroup's 2013 Talent Shortage Survey, and the shortage is expected to intensify as demand grows for shipping via truck and drivers retire; the average age for truck drivers nationwide in 2014 is 50.⁷

Plastics and Machine Manufacturing

Manufacturing accounted for almost 16 percent of all non-farm jobs in the Southeast region in 2008, though both the number of manufacturing firms and manufacturing jobs declined during the 2007-2009 recession. Still, both plastics and rubber manufacturing and machine manufacturing remain significant industries in the area. As the global economy recovers, analysts expect "quite impressive" growth in the worldwide market for industrial machinery between 2014 and 2018,⁸ driven by consumer products such as cars and food as well as oil and gas exploration, construction, and green energy. Annual growth is projected to be 6.3 percent in 2014 (more than double the 2.9 percent increase seen in 2013) and growth should average between five and six percent between 2014 and 2018.

The year-over-year output of the U.S. plastics industry grew by six percent in the second quarter of 2014, largely due to strong demand from the durable goods and motor vehicles sectors. This trend is projected to continue through 2015, and plastics firms in the Southeast District are expected to share in this growth. Although automobile manufacturing declined during the recent recession, a number of auto suppliers in Missouri announced significant expansions in 2012 and 2013.⁹ TG Missouri is expanding its plant in Perryville to add a new production line that will supply chrome and plastic components to Toyota. The \$38.9 million investment will add 200 jobs.

A recent survey by the National Association of Manufacturers¹⁰ found that three fourths of respondents across the U.S. were struggling to find qualified workers, and 88 percent cited a lack of skills as the reason. According to the survey, firms have increased employee training and many now rely on technical and community college programs to provide the workers they need to maintain and grow their businesses. A local example is the partnership announced in 2013 between SRG Global in Portageville, one of the world's largest manufacturers of chrome-plated plastic auto parts, and Three Rivers Community College. State funding from the state's Community College Job Retention Training Program will be used to enhance the skills of 350 SRG employees.

Transportation equipment, chemicals (including plastics), and machinery were the three top Missouri exports to Canada in 2013. Canada is already the largest importer of Missouri goods, and trade discussions with several Canadian provinces in 2014 point to increases in exports of Missouri products. The State has signed trade agreements with Quebec, Korea, Taiwan, China, Brazil, and several European countries to sell \$9.7 billion in Missouri products over the next four years, according to the Governor's office.¹¹

Agriculture and Forestry

Agriculture and forestry provide significant jobs in Southeast Missouri. Rice, soybeans, corn, and cotton are grown in the eastern

⁴ MERIC, 2013 Business Formations

⁵ MERIC, Missouri's Top Openings 2012-2022

⁶ Woods and Poole

⁷ Williams, G. Chambers, "Trucking industry faces uphill battle to recruit drivers," The Tennessean, August 25, 2014.

⁸ Jonathan Cassell, IHS Technology, "Rise of the Machines: Industrial Machinery Market Growth to Double in 2014," April 16, 2014.

⁹ <http://governor.mo.gov/news/>, accessed August 27, 2014

¹⁰ "Mind the Gap," Member Focus, the newsletter of the National Association of Manufacturers, May 2013

¹¹ <http://governor.mo.gov/news/archive>

Southeast District Profile

part of the region, and exports of these crops continue to grow as demand for U.S.-produced agricultural products increases. Missouri's food and food ingredient exports increased 148 percent between 2005 and 2011.¹² A number of smaller farms, facing increasing competition from corporate growers, have turned to specialty crops. The Southeast District is home to a rapidly growing wine industry, with 46 vineyards and wineries in Southeast Missouri listed by the Missouri Grape Growers Association in 2013. Most of these are in Ste. Genevieve County. The Mississippi River Hills Association aims to strengthen the region's economy by supporting specialty agriculture and related tourism markets.

Wood products form another industry cluster in the south central area of the State. The region is a leading U.S. producer of wood pallets, which fits well with the State's status as a logistics hub. Demand for pallets should remain strong with the Federal Highway Administration projecting U.S. freight will double by 2020.

Retail and Wholesale Trade

Job opportunities in retail trade are expected to be above average between 2012 and 2022. Cashiers are projected to have the most openings of any occupation at 3,358 and retail salespersons will have 2,097 openings.¹³ In 2011 retail trade accounted for almost 12 percent of the District's jobs. Though internet sales will continue to compete with brick-and-mortar stores, both depend on efficient freight transportation to get their products in the hands of consumers. Wholesale trade is also important to the economy of the Southeast District, providing more than three percent of jobs in 2011. Growth is anticipated in both wholesale and retail trade in the next few years as the country and the world recover from the recent global recession.

Importance of Freight to the Economic Development Future of the Southeast District

Manufacturing and Exports

Manufacturing continues to be a vital part of Missouri's economy and exports of Missouri manufactured goods continue to increase. Missouri businesses exported over \$3 billion in goods by the close of the first quarter of 2014, and nearly \$13 billion in 2013.^{14,15} Four primary industries in the manufacturing sector accounted for over 62 percent of Missouri exports: transportation equipment, chemicals, food and kindred products, and machinery related businesses. These industries exported over \$8 billion in products in 2013.¹⁶ Agricultural products, fabricated metal products, electrical equipment, minerals and ores, primary metal manufacturing, and computer and electronic products round out the top 10 exports from the State in 2013. Over 6,100 businesses in Missouri exported products and services in 2012, and 89.5 percent of Missouri's exports are manufactured goods produced in communities around the state. Manufacturing exports support nearly 107,000 jobs in the State, and 85 percent of the companies engaged in exporting goods and services are small businesses.¹⁷

Manufacturing matters in Missouri because:

- Employees in manufacturing firms earn an average of \$77,060 annually in pay and benefits, while average workers in all industries earn \$60,168. This means manufacturing jobs pay, on average, 19.9 percent more than non-manufacturing jobs.¹⁸
- Manufacturing firms account for nearly two-thirds of all research and development in the U.S. and are a leading user of new technologies and processes.¹⁹
- Manufacturing has the highest multiplier effect of any economic sector. For every dollar spent in manufacturing another \$1.48 is added to the economy, helping to stimulate economic growth.
- Missouri's economy is intrinsically linked to its ability to move people, materials, components, and finished goods within the State and to national and international destinations.
- Missouri's principal trading partners are Canada, Mexico, China, Japan, and Korea.²⁰ The five industries with the most significant job dependence on exports include grain farming, oilseed farming, wholesale trade, and aircraft

¹² www.missouripartnership.com

¹³ MERIC, Missouri's Top Openings 2012-2022

¹⁴ WISER Export Trade data, 2014

¹⁵ U.S. Census Freight Trade State Exports, Missouri

¹⁶ Missouri Economic Research and Information Center, Missouri Department of Economic Development, March 2013

¹⁷ U.S. Department of Commerce, International Trade Administration, National Association of Manufacturing, 2013

¹⁸ Bureau of Economic Analysis, Industry Economic Accounts, 2011

¹⁹ Brookings Institute, Metropolitan Policy Program, "Why Does Manufacturing Matter?" February 2012

Southeast District Profile

manufacturing. Agriculture continues to play a significant role in the Southeast District's economy. The district has experienced growth in grape products, vineyards, and wineries, and in sunflowers, grains, oilseeds, and organic vegetables. The number of farms in the region has increased since 2002 as technological advances have made farming more productive and profitable.²¹

- Export products are intrinsically dependent on multimodal freight transportation.

Conclusion

MoDOT's Southeast District has a diverse economy, and the outlook for the future is promising. In addition to the TG Missouri plant expansion mentioned above, Noranda Aluminum will spend \$45 million to enlarge its smelting operation in New Madrid. Investments in manufacturing such as these will add jobs to the area, both directly and indirectly. Strong demand for the region's corn, soybeans, rice, cotton, and wood products as well as the growing wine industry will enable the agriculture sector to continue to contribute to the area's economy as well. The increased demand for Southeast Missouri agricultural products and manufactured goods will, in turn, drive growth in the freight and warehousing industry, resulting in more jobs for truck drivers, freight handlers, and logistics experts. Finally, employment growth in all of these sectors will contribute to the predicted increases in population—and more residents means higher demand for consumer products that must be delivered to local stores and homes throughout the District.

All of this depends on a dependable, efficient freight network. Manufacturers of plastics, machinery, and other products depend on the statewide freight infrastructure to deliver raw materials and components and to carry finished products to assembly plants, distributors, and end users. Farms that grow rice, cotton, corn, and soybeans rely on the District's rail, highway, and water ports to deliver their output to markets across the country and around the world. Along with smaller farm operations and the growing winemaking sector, they also depend heavily on the District's many secondary roadways to link them with the broader transportation network. Businesses also rely on these secondary roads for time-sensitive deliveries, and trucks of all sizes use them to supply grocery stores, offices, building sites, and homes with the goods, materials, and products they need every day. Research shows that investing in physical infrastructure reduces costs and improves efficiencies in conducting business, boosts job creation, and fosters growth cycles within countries.²² Based on this research, maintaining the existing freight system and expanding both its capacity and its connections in ways that increase reliability and reduce costs are critical to the future prosperity of the businesses and residents of the Southeast District.

²⁰ US Census, State Exports, Foreign Trade, 2013

²¹ 2010 Census of Agriculture, USDA, Southeast Missouri Regional Planning and Economic Development District

²² Deloitte LLP and the Council on Competitiveness, "2013 Global Manufacturing Competitiveness Index"

SOUTHWEST DISTRICT PROFILE: Freight and the District's Economic Future



Global trade and new technologies continue to transform the economy, redefining the way businesses operate, challenging supply chains and transportation networks, and creating new customer opportunities for Missouri businesses in places where they were once inconceivable. Businesses and their employees are more dependent than ever on integrated, agile, and efficient transportation networks to sustain economic competitiveness and facilitate journeys to work and connections to markets.

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Southwest Missouri Population Trends

Missouri's population is projected to grow, with the 2012 population of 6,021,988 increasing to 7,159,350 by 2040. The modest population growth experienced by MoDOT's Southwest District from 2000 to 2012 is expected to continue, with the 2012 population of 931,498 projected to grow to 1,261,290 by 2040.¹ Greene County, which includes the City of Springfield, and is the most populous county in the District, saw its population increase by 39,611, an average of 1.28 percent per year, between 2000 and 2012. Between 2012 and 2040 Greene County is projected to add 116,394 residents, an average growth rate of 1.25 percent per year. Barton, Dade, and St. Clair Counties experienced a decline in population between 2000 and 2012, but between 2012 and 2040 all of the counties in the district are projected to gain in population. Christian and Taney Counties experienced the greatest percentage growth in population from 2000 to 2012, and Christian, Newton, and Taney Counties are projected to have the highest percentage of growth between 2012 and 2040. Modest population growth often tempers the expansion of non-traded sector businesses that are generally driven by population growth, such as local professional services (legal, accounting, and medical), local retail trade, real estate and financial services, and food service and restaurants.

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Transportation Dependence: Missouri and the Southwest Missouri Economy

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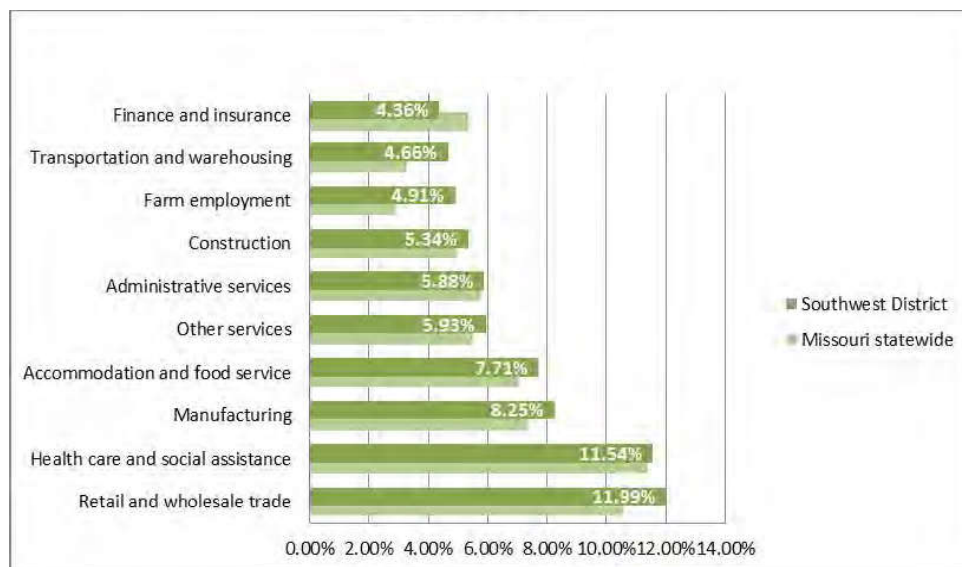
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As noted in Figure 1, the importance of transportation to these key industry sectors can be measured by the amount each sector spent on transportation as a share of its total output.

The project team evaluated several primary industry sectors and identified the corresponding industrial classification codes for each key sector to compare the applicable transportation costs per dollar of product output using the transportation satellite accounts research. Key business sectors for the Southwest District are shown in Table 1.

² U.S. DOT Research and Innovative Technology Administration, "Transportation Satellite Accounts: A Look at Transportation's Role in the Economy"

³ Bureau of Labor Statistics, US Census 2012, County Business Patterns

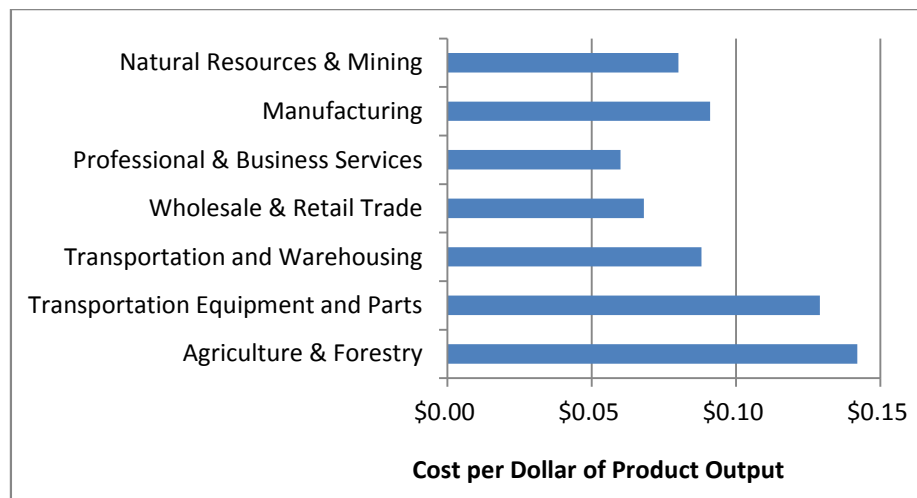
Southwest District Profile

Table 1: North American Industrial Classifications for Key Industrial Sectors, Southwest District

Industrial Sectors	North American Industrial Classification Sector
Food processing	Manufacturing
Warehousing and distribution	Transportation and Warehousing
Advanced manufacturing	Manufacturing
Precision machining	Manufacturing
Retail and wholesale trade	Retail and Wholesale Trade
Energy	Energy

Figure 2 shows the transportation cost per dollar of product output for several important existing industry sectors in the Southwest District based on their NAICS code. Improvements in transportation costs and services would have a significant effect on the profitability of companies in these industries, as lower transportation costs and more reliable service help reduce the cost of materials, resulting in lower overall production costs. Reliable delivery of materials can enhance productivity, and reducing distribution costs to the consumer may also improve competitiveness.

*Figure 2: Transportation Cost as a Share of Sector Output
(Transportation cost per \$ of product value)*



*Source: Transportation Satellite Accounts database, Bureau of Transportation Statistics
Research and Innovation Technology Administration*

The Southwest District has been successful in retaining and attracting transportation-dependent businesses in several significant economic sectors as described in **Table 2**.

Southwest District Profile

Table 2: Economic Sectors the Southwest District has retained and attracted transportation-dependent businesses:

Transportation, Logistics, and Freight	Agriculture and Food Processing	Machine Manufacturing
Blue Buffalo	Jasper Products	Cardinal Scale
SRC Logistics	Red Monkey Foods	Loren Cook Company
Kraft	Hiland Dairy	John Deere
Prime, Inc.	JM Smucker Co.	Able Manufacturing
Coca Cola	Butterball	
Con-Way Truckload	International Dehydrated Foods	Jarden Consumer Solutions

Economic Development Trends

The State of Missouri overall had 17,109 new businesses in 2013. Greene County, which includes the City of Springfield, was one of the leading locations for new business starts, and Jasper, Christian, and Taney Counties also had between 400 and 1,000 new business formations each.⁴ Many of the important industry sectors in MoDOT's Southwest District have seen growth in recent years. The industry sectors described below represent historically significant and emerging businesses in the Southwest District.

Food Processing

National food manufacturers such as Archer Daniels Midland, Bimbo Bakeries, Cargill, Coca-Cola, Pepsi, Tyson Foods, Dr. Pepper/Snapple, General Mills, JM Smucker Co., and Kraft Foods employ many of the District's residents. This is not surprising given the importance of farming and agricultural production in the Southwest District. The State ranked seventh in milk cow operations in 2007 and seventh in ice cream production in 2011, and dairy product manufacturing represents a significant part of the economy in the eastern part of the Southwest District. Employment in the industry dropped more than 30 percent between 2007 and 2009 during the recent recession, but has since increased. Hiland Dairy, with headquarters in Springfield, is a major employer in the District. The firm produces butter, cream, cheeses, dips, egg substitute, ice cream, yogurt, sour cream, and other products.

A large number of poultry hatcheries and turkey production facilities are also located in the region, and poultry processing accounts for a large share of food manufacturing jobs. Butterball has a turkey processing facility in Carthage, and International Dehydrated Foods, a leading producer of fresh, frozen, powdered, and concentrated meat and poultry ingredients, has its headquarters in Springfield. Soybeans are one of the State's most important crops, and Jasper Products is a major manufacturer of soy beverages. Its headquarters are in Joplin. The number of organic farms in the state has increased significantly, and the acreage devoted to organic farming is expected to double.⁵ Red Monkey Foods announced in September 2014 that it is moving to Greene County; the company makes organic spices, dips, and rubs.

Demand for value-added food products is increasing, especially among emerging world economies, and this boosts U.S. exports. Missouri, as a top producer of food products, will share in this growth as foreign countries continue to recover from the global recession.

⁴ MERIC "2013 Business Formations in Missouri"

⁵ MERIC, Missouri Economic Research Brief: Farm and Agribusiness, March 2009

Southwest District Profile

Warehousing and Distribution

Missouri's central location and robust freight transportation network make it a prime location for warehouses and distribution centers. The Southwest Missouri Foreign Trade Zone at the Springfield-Branson National Airport enables goods to enter the U.S. without paying import taxes, boosting the competitiveness of U.S.-based companies. The FTZ includes 23 counties, 18 of them in MoDOT's Southwest District. In 2012 the FTZ was expanded to include Jarden Consumer Solutions, taking advantage of a new rule allowing companies beyond the airport property to become part of an FTZ. Jarden, located in Neosho, handles brands including Crock-Pot, Oster, Mr. Coffee, and Sunbeam. The Southwest District is already home to major distribution centers for Bass Pro Shops, Blue Buffalo, Coca-Cola, General Mills, John Deere, Kraft Foods, La-Z-Boy, McLane, and O'Reilly Auto Parts, and other firms are expanding or locating new facilities in the region. Covington Retail Partners, which the Springfield Business Journal named as one of the fastest growing firms in southern Missouri, is building a distribution and warehouse center in Republic to supply Ashley Furniture stores in Joplin, Springfield, and elsewhere in the State.⁶ The investment will create 32 new jobs. In 2012 Arrowhead, a distributor and wholesaler of exterior building materials, and Don's Cold Storage, which provides temperature-controlled warehousing and transportation, also announced plans to build new facilities in the region. Two major third-party logistics firms have a strong presence in the region: C.H. Robinson, one of the world's largest third-party logistics providers, has a facility in Springfield and SRC Logistics is headquartered there.

The warehousing and distribution sector should remain strong as population increases and the nation and the world continue to recover from the recession. Nationally, the volume of freight is expected to double by 2024 and the Southwest District is well positioned to benefit from this growth. Laborers and freight, warehouse, and material movers rank among the region's top ten job openings for 2022, according to MERIC.⁷

Advanced Manufacturing

Manufacturing was responsible for the third largest share of Missouri's gross state product in 2012—12.5 percent, up from 11.9 percent in 2011.⁸ Manufacturing accounts for an especially large share of the Southwest District's economy, more than in any of the other MoDOT Districts. Advanced manufacturing accounts for just over 40 percent of the State's manufacturing jobs, and the sector is critical to the Southwest District's economy. The Missouri State University Center for Applied Science and Engineering (CASE) in Springfield supports advanced manufacturing through research in carbon-based electronics and devices, materials research, and systems fabrication. Major employers in advanced manufacturing include those described below.

Able Manufacturing & Assembly Co. in Joplin specializes in light metal fabrication and welding, thermoform plastic production, and composite fiberglass fabrication for original equipment manufacturers in the marine, aerospace, passenger rail, specialty vehicle, construction, agriculture, and cooling industries. In 2008 the firm also began making components for wind turbine manufacturers, and by 2012 this business had become one of its top three markets.

The Loren Cook Company in Springfield uses cutting-edge technology, state-of-the-art computer software, and advanced testing labs to produce industrial and commercial fans and blowers, exhaust systems, and energy recovery ventilators. Leggett & Platt, Inc., an S&P 500 firm with headquarters in Carthage, manufactures components used in bedding and other residential furnishings; seat mechanisms and controls, bases, and other office furniture components; steel wire products; and automotive seating. Its 2013 annual report predicts two to three percent revenue growth for the next five years.

Precision Machining

Companies in this industry hire skilled workers such as machinists, welders, and machine tool operators, and pay wages that are about 30 percent higher than the average income for the region.⁹ Furthermore, adding 100 employees in the primary metal manufacturing industry creates an estimated total of 175 direct and indirect jobs and contributes over \$10 million to the gross state product. The value-added per worker in fabricated metal product manufacturing and its supporting industries in 2010 was \$57,143.¹⁰ The Paul Mueller Company in Springfield designs and manufactures stainless steel tanks, processing systems, and equipment for the food, dairy, beverage, chemical, biofuels, pharmaceutical, biotech, and pure water industries. The firm fabricates structural components using metal cutting, forming, and welding equipment with advanced fabrication and

⁶ Missouri Dept. of Economic Development press release dated Aug. 5, 2013; accessed at <http://ded.mo.gov/News/>

⁷ MERIC, Top Job Openings 2012-2022 for West Central Region, Southwest Region, and Greater Springfield Region

⁸ MERIC, Missouri Economic Indicator Brief: Missouri Economic Diversity, January 2014

⁹ MERIC Pattern Analysis, Winter 2010.

¹⁰ Ibid

Southwest District Profile

machining techniques, and it exports its finished products to over 100 countries. Though sales fell during the recent recession, the company appears to be recovering and is positioned for growth.¹¹

FAG Bearings Corporation, a division of Schaeffler Group USA, manufactures precision bearings for the automotive industry and for John Deere. The firm, which has been in Joplin since 1970, received funding from the state in 2012 to improve workers' technical skills on new machinery to be provided as part of FAG's \$41.1 million capital investment in Joplin. The training is being provided through the Missouri Department of Economic Development by Crowder College to support the manufacture of large ring bearings used in wind-powered generators.

Energy

The energy solutions cluster in Missouri employed more than 53,000 workers in 2011, and growth in energy manufacturing resulted in exports of more than \$4 billion.¹² The U.S. Energy Information Administration (EIA) predicts 53 percent growth in global energy consumption between 2008 and 2035. Fossil fuels will continue to supply most of the world's energy needs for several decades, but because they are a finite resource, increasing demand will drive up prices and renewable energy sources will become more attractive. According to EIA, renewable energy will be the fastest growing form of energy.¹³ Several firms in the Southwest District supply components for the alternative energy market, including those described below.

EaglePicher Technologies LLC, based in Joplin, is an industry leader in energy storage solutions for the defense, aerospace, commercial, medical, and grid energy markets. The firm's batteries have been used in U.S. space missions since 1958 and more than 500 spacecraft currently in orbit rely on the company's products. IHS reported in 2013 that the U.S. energy storage market is "set to explode" as demand for renewable energy grows.

As noted previously, Able Manufacturing and Assembly in Joplin, a major employer in the region, manufactures components for wind turbines and this segment of its business has doubled every year since 2008. Schaeffler Group USA Inc. and its FAG Bearings subsidiary in Joplin also manufacture bearings as well as lubricants, monitoring systems, and mounting and maintenance tools for wind turbines.

Crowder College in Neosho is home to the Missouri Alternative and Renewable Energy Technology Center, which has been a leader in solar technology for more than 30 years. Crowder College also offers multiple alternative energy degree programs and certificates with specialties in biofuels, solar, and wind energy.

Retail and Wholesale Trade

Retail trade is critical to the economy of the urban metro areas of Springfield and Joplin, and it has an especially strong presence in the heavily tourism-oriented area around Branson. Retail sales rank among the top 10 job openings for the region for 2022,¹⁴ and job opportunities in wholesale and retail trade are expected to be above average for the same period. Though internet sales will continue to compete with brick-and-mortar stores, both depend on efficient freight transportation to get their products in the hands of consumers. Overall growth is anticipated in both wholesale and retail trade in the next few years as the country and the world recover from the recent global recession.

Importance of Freight to the Economic Development Future of the Southwest District

Manufacturing and Exports

Manufacturing continues to be a vital part of Missouri's economy, and exports of Missouri manufactured goods continue to increase. Missouri businesses exported over \$3 billion in goods by the close of the first quarter of 2014, and nearly \$13 billion in 2013.^{15,16} Four primary industries in the manufacturing sector accounted for over 62 percent of Missouri exports: transportation equipment, chemicals, food and kindred products, and machinery related businesses. These industries exported over \$8 billion

¹¹ Wall Street Journal MarketWatch, "An Underappreciated Turnaround at Paul Mueller," May 1, 2014; accessed at www.marketwatch.com

¹² MERIC, Missouri Targets: Energy Solutions, April 2012

¹³ Ibid.

¹⁴ MERIC, Top Job Openings 2012-2022 for West Central Region, Southwest Region, and Greater Springfield Region

¹⁵ WISER Export Trade data, 2014

¹⁶ U.S. Census Freight Trade State Exports, Missouri

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in products in 2013.¹⁷ Agricultural products, fabricated metal products, electrical equipment, minerals and ores, primary metal manufacturing, and computer and electronic products round out the top ten exports from the state in 2013. Over 6,100 businesses in Missouri exported products and services in 2012, and 89.5 percent of Missouri's exports are manufactured goods produced in communities around the State. Manufacturing exports support nearly 107,000 jobs in Missouri, and 85 percent of the companies engaged in exporting goods and services are small businesses.¹⁸

Manufacturing matters in Missouri because:

- Employees in manufacturing firms earn an average of \$77,060 annually in pay and benefits, while average workers in all industries earn \$60,168. This means manufacturing jobs pay, on average, 19.9 percent more than non-manufacturing jobs.¹⁹
- Manufacturing firms account for nearly two-thirds of all research and development in the U.S. and are a leading user of new technologies and processes.²⁰
- Manufacturing has the highest multiplier effect of any economic sector. For every dollar spent in manufacturing another \$1.48 is added to the economy, helping to stimulate economic growth.
- Missouri's economy is intrinsically linked to its ability to move people, materials, components, and finished goods within the State and to national and international destinations.
- Missouri's principal trading partners are Canada, Mexico, China, Japan, and Korea.²¹ The five industries with the most significant job dependence on exports include grain farming, oilseed farming, wholesale trade, and aircraft manufacturing.
- Export products are intrinsically dependent on multimodal freight transportation.

Conclusion

MoDOT's Southwest District has a diverse economy, and the outlook for the future is promising. Food processing is a significant employment sector, and domestic demand as well as exports of food products to established trade partners including Canada, Mexico, China, Taiwan, and Korea along with emerging markets, are expected to grow. The District's economy is also dependent on advanced manufacturing and precision machining, and a growing cluster of businesses are involved in the production of components for the alternative energy industry. These jobs are vital as they offer above average wages, and forecasts for machinery, transportation equipment, and energy-related manufacturing are encouraging. Increases in the Southwest District's food products and manufacturing output will, in turn, drive growth in the critical freight and warehousing industry, resulting in additional investment and more jobs for freight handlers and logistics firms. The employment growth resulting from all of these industries will result in increases in retail and wholesale trade as well, and more residents means higher demand for consumer products that must be delivered to local stores and homes throughout the District.

All of this depends on a reliable, efficient freight network. Manufacturers rely on the State's freight infrastructure to deliver raw materials and components and to carry their products to assembly plants, distributors, and end users. Farms depend on rail lines, highways, ports, and airports to deliver their output to markets across the country and around the world. The secondary roads that cross the district are critical for time-sensitive deliveries to grocery stores, offices, building sites, and homes of the goods, materials, and products that people and businesses need every day.

Research reveals that investing in physical infrastructure reduces costs and improves efficiencies in conducting business, boosts job creation, and fosters growth cycles within countries.²² Based on this research, maintaining the existing freight system and expanding both its capacity and its connections in ways that increase reliability and reduce costs are critical to the future prosperity and economic vitality of the businesses and residents of the Southwest District.

¹⁷ Missouri Economic Research and Information Center, Missouri Department of Economic Development, March 2013

¹⁸ U.S. Department of Commerce, International Trade Administration, National Association of Manufacturing, 2013

¹⁹ Bureau of Economic Analysis, Industry Economic Accounts, 2011

²⁰ Brookings Institute, Metropolitan Policy Program, "Why Does Manufacturing Matter?" February 2012

²¹ US Census, State Exports, Foreign Trade, 2013

²² Deloitte LLP and the Council on Competitiveness, "2013 Global Manufacturing Competitiveness Index"

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Global trade and new technologies continue to transform the economy, redefining the way businesses operate, challenging supply chains and transportation networks, and creating new customer opportunities for Missouri businesses in places where they were once inconceivable. Businesses and their employees are more dependent than ever on integrated, agile, and efficient transportation networks to sustain economic competitiveness and facilitate journeys to work and connections to markets.

To compete in this global marketplace, businesses must optimize every asset—workforce skills, competitively priced products, and reliable transportation systems—to ensure their customers receive quality goods and services when they expect them. As the importance of trade and the demands of customers continue to evolve, Missouri companies often find freight an increasingly important factor in sustaining and enhancing their competitive position in the marketplace. Freight supports the domestic and international trade of Missouri businesses, and supports State and local economic development and job growth.

St. Louis District Population Trends

Missouri's population is projected to grow, with the 2012 population of 6,021,988 increasing to 7,159,350 by 2040. The modest population growth experienced by the MoDOT St. Louis District from 2000 to 2012 is expected to continue, with the 2012 population of 2,008,897 projected to increase by approximately ten percent to 2,220,210 by 2040.¹ The City of St. Louis and St. Louis County experienced a decline in population between 2000 and 2012, and between 2012 and 2040 the City is projected to lose population as well. St. Charles County experienced the greatest growth in population from 2000 to 2012, adding more than 82,000 residents during this period. St. Charles and Jefferson counties are expected to be responsible for most of the region's growth between 2012 and 2040. Modest population growth often tempers the expansion of non-traded sector businesses that are generally driven by population growth, such as local professional services (legal, accounting, and medical), local retail trade, real estate and financial services, and food service and restaurants.

Freight is an increasingly important factor in sustaining and enhancing the economic competitiveness of businesses in Missouri and in the St. Louis District.

Transportation Dependence: Missouri and the St. Louis District Economy

Freight transportation represents a key competitiveness factor for St. Louis District businesses. Companies today compete on more than product quality and cost. The transportation networks serving their facilities must provide reliable connections to buyers and link to a multitude of markets to ensure timely deliveries of goods and services and provide access for employees and customers. Some business sectors use transportation facilities and services more extensively than others. An industry sector's dependence on transportation can be measured by examining the amount a business sector spends on transportation

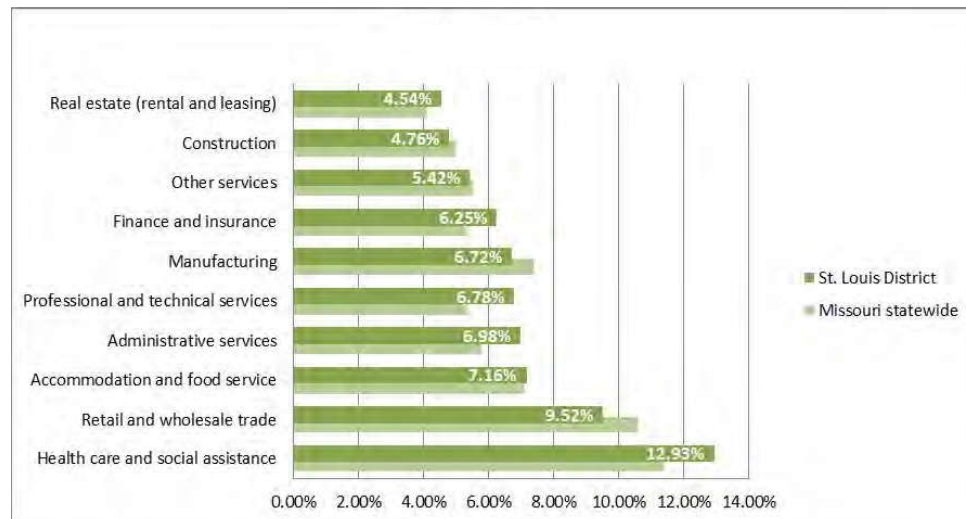
¹ US Census Intercensal Estimates, July 2000; US Census Annual Estimates; 2013 CEDDS by Woods and Poole Economics

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as a share of its total output.² Transportation satellite accounts provide national data regarding the amount spent on transportation per dollar of output for various sectors.

To better understand the role freight and goods movement play in the St. Louis District and the contribution of multimodal transportation to the economic vitality of the District's key industry sectors, the project team evaluated the importance of these key industrial sectors based on the non-government employment concentrations in the District. Just over 70 percent of the District's non-government employment is concentrated in 10 sectors: health care and social services, retail and wholesale trade, accommodation and food service, administrative services, professional and technical services, manufacturing, finance and insurance, other services, construction, and real estate.³ Figure 1 shows the breakdown of these employment sectors, by percentage of total employment, for the St. Louis District and for the State of Missouri.

Figure 1: Top Ten Non-Government Employment Sectors, St. Louis District



As noted in Figure 1, the importance of transportation to these key industry sectors can be measured by the amount each sector spent on transportation as a share of its total output.

The project team evaluated several primary industry sectors and identified the corresponding industrial classification codes for each key sector in order to compare the applicable transportation costs per dollar of product output using the transportation satellite accounts research. Key business sectors for the St. Louis District are shown in Table 1.

Table 1: North American Industrial Classifications for Key Industrial Sectors, St. Louis District

Industrial Sectors	North American Industrial Classification Sector
Advanced Manufacturing	Manufacturing
Agricultural Sciences and Technology	Manufacturing
Information Technology	Information
Technical and Professional Services	Professional, Scientific, and Technical Services
Transportation and Logistics	Transportation and Warehousing
Aerospace Manufacturing	Manufacturing
Industrial Machinery Manufacturing	Manufacturing

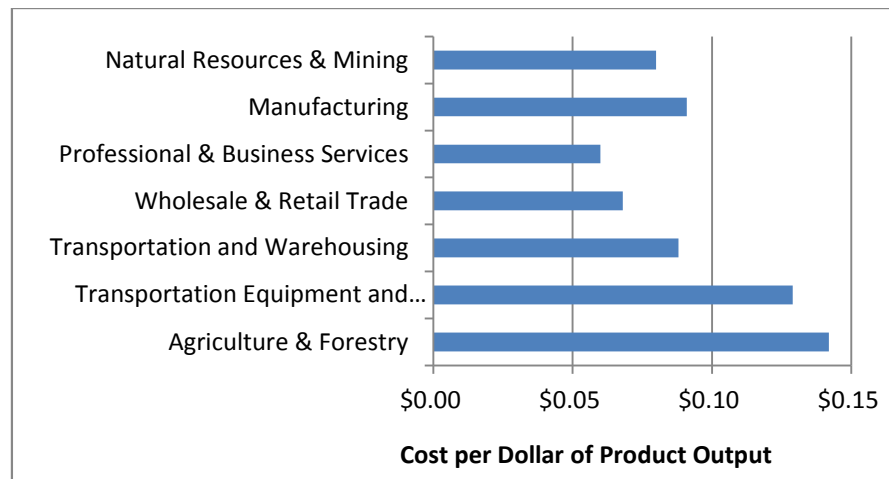
² "Transportation Satellite Accounts: A Look at Transportation's Role in the Economy," U.S. DOT Research and Innovative Technology Administration

³ Bureau of Labor Statistics, US Census 2012, County Business Patterns

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Figure 2 shows the transportation cost per dollar of product output for several important existing industry sectors in the St. Louis District based on their NAICS code. Improvements in transportation costs and services would have a significant effect on the profitability of companies in these industries, as lower transportation costs and more reliable service help reduce the cost of materials, resulting in lower overall production costs. Reliable delivery of materials can enhance productivity, and reducing distribution costs to the consumer may also improve competitiveness.

*Figure 2: Transportation Cost as a Share of Sector Output.
(Transportation cost per \$ of product value)*



Source: Transportation Satellite Accounts database, Bureau of Transportation Statistics, Research and Innovation Technology Administration

The St. Louis District has been successful in retaining and attracting transportation-dependent businesses in several significant economic sectors as described in **Table 2**:

Table 2: Economic Sectors the St. Louis District has retained and attracted transportation-dependent businesses

Transportation, Logistics, and Freight	Machine Manufacturing	Chemical Manufacturing
SYSCO Corporation	Lincoln Industrial	Sigma-Aldrich
Graybar	True Manufacturing	Solutia
UPS	Crane Merchandising Systems	ICL Performance Products LP
Exel	Avmats	Purina Mills LLC
C.H. Robinson	Central Mine Equipment	Pfizer
Cheyenne Logistics	Mark Andy Inc.	K-V Pharmaceutical Co.
Artur Express	Ingersoll-Rand	Sanofi-Aventis U.S.
World Wide Technology	Coinco Products	Meridian Medical Tech Inc.
Hogan 1	Duke Manufacturing	Carboline Company
UniGroup	Melton Machine & Control	The Dial Corporation

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Economic Development Trends

Advanced Manufacturing

Advanced manufacturing employed 100,336 Missouri residents in 2012, more than 40 percent of the State's manufacturing workforce. The St. Louis District houses a significant cluster of advanced manufacturing firms including several Fortune 500 companies. Innovative companies include Zoltek, a carbon fiber manufacturer with two facilities in the area, which is locating its new research and development and manufacturing facility in St. Peters; and Emerson, an international manufacturer of electrical, electromechanical, and electronic products with headquarters in St. Louis. Watlow, a leading global thermal systems manufacturer headquartered in St. Louis, announced in March 2014 it plans to construct an advanced technology center at its facility in Maryland Heights to house its research and development team. SunEdison, also headquartered in St. Louis, is a leading producer of silicon wafers used in microprocessors and logic devices as well as solar cells, and numerous firms in the area supply chemicals, batteries, modules, electronics, and testing equipment for the solar power industry. Automobile manufacturing is well-represented in the area as well. Emerald Automotive will build hybrid electric vans at a new \$175 million facility in Hazelwood, and in 2011 General Motors announced an additional investment of \$380 million in its Wentzville operations, where it makes pickups and vans. Lear Corporation, also in Wentzville, makes automobile seating and electrical systems.

Colleges and universities in the area offer programs that support the advanced manufacturing sector. Several offer associate's level degrees in precision production, and the Emerson Center for Engineering at St. Louis Community College features lab space, classrooms, and state-of-the-art tooling and equipment for training in materials, quality assurance, civil engineering, electronics, computer drafting and design, and skilled trades. Missouri Tech, Saint Louis University, the University of Missouri-St. Louis, Vatterott College, and Washington University all have bachelor's and graduate level programs in engineering. Washington University also houses the Center for Materials Innovation, which focuses on magnetic, biological, biomedical, and amorphous materials and nanomaterials; and the Institute of Materials Science and Engineering, which brings together researchers in engineering, physics, chemistry, and earth and planetary sciences to leverage interdisciplinary materials research.

Aerospace Manufacturing, Research, and Development

The aerospace industry, a specialized segment of the advanced manufacturing sector, employed 17,518 workers in Missouri in 2012.⁴ Boeing has more than 15,000 employees at its Defense, Space, and Security Unit in St. Louis, which includes military aircraft, missiles, airborne lasers, unmanned combat air vehicles, and information and communications satellites. The unit also holds a prime contract with NASA to support the International Space Station. LMI Aerospace, which is expanding its headquarters and manufacturing facilities in St. Charles, manufactures door and cockpit window frames, skins for wings and fuselages, and interior components. GKN Aerospace is a first-tier supplier of structures, components, and engineering services to Boeing and other aircraft and engine manufacturers. The industry cluster is supported by the Aerospace Research and Education Center (AeREC), a consortium of Washington University, Saint Louis University, the University of Missouri-Columbia, and Missouri University of Science and Technology. AeREC partners with the aerospace industry and with government and provides education through innovation, research, and technology development and transfer. Other college and university centers focused on the aerospace industry include the Aerospace Institute at St. Louis Community College, which trains potential workers for entry-level technician positions; the Center for Aviation Safety Research at St. Louis University, established by Congress to serve as the central resource for developing sustainable safety initiatives; and the Space System Research Laboratory, also at St. Louis University, which focuses on design, fabrication, and operations.

St. Louis has a strong aerospace manufacturing industry with substantial support in workforce training and research and development. Growth in these areas depends in large part on the domestic and global economies, however. Demand for both passenger and cargo aircraft is expected to grow, following contractions in both fleets since the recent global recession. A dramatic increase is forecast in annual production levels of commercial aircraft by 2023, driven by increased passenger travel (especially in the Middle East and Asia/Pacific regions) and the need to replace obsolete aircraft with the next generation of fuel efficient vehicles. New global competition in this market, and its impact on the supply chain, are challenges to consider, however. Defense spending is expected to contract over the next few years with the end of conflicts in Iraq and Afghanistan, and the U.S. and most other countries are scaling back on military spending.⁵ One bright spot lies in unmanned aircraft systems, which Boeing's St. Louis campus supports. Worldwide annual spending on research, development, testing, and evaluation

⁴ Bureau of Labor Statistics, Quarterly Census of Employment and Wages, 2012.

⁵ Deloitte, "2014 Outlook on Aerospace & Defense." www.deloitte.com/view/en_US/us/Industries/industry-outlook.

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procurements for such systems are projected to grow from \$6.6 billion in 2013 to \$11.4 billion in 2033, with spending over the next ten years totaling \$89.1 billion.⁶

Industrial Machinery Manufacturing

The industrial machinery manufacturing sector produces equipment for sawmills and other woodworking processes, the plastics and rubber industry, and for manufacturing paper, textiles, printing, food products, and semiconductors. It employed over 1,700 in the state in 2009 at an average wage of \$47,732, and exported \$75 million that year, primarily to Canada and Mexico but also to Singapore, the U.K., Germany, Nigeria, China, Australia, Malaysia, and India. Both St. Louis County and Franklin County have a concentration of jobs in this sector. Mark Andy Inc. in Chesterfield makes web printing equipment under the Comco, Mark Andy, and Rotoflex brands. As the global economy recovers, analysts expect “quite impressive” growth in the worldwide market for all industrial machinery in the next four years. Annual growth is projected to be 6.3 percent in 2014, more than double the 2013 increase of 2.9 percent, and growth should average between five and six percent through 2018.⁷

Agricultural Sciences and Technology

Another important sector for the St. Louis District centers on the research and technology side of the agriculture industry. Monsanto, a global leader in bioscience and sustainable agriculture research, announced in April 2013 it would invest over \$400 million in a new state-of-the-art research building, 36 new greenhouses, and 250 new labs to further develop its seed and trait pipeline. The expansion will add 675 jobs over three years to the 1,000 employees who already work at the site. The Danforth Plant Science Center supports education, industry, and innovation at its research center in St. Louis, focusing on plant-based energy, new green technology, and better food crops through live cell imaging and electron microscopy. Industry partners include Monsanto and Enterprise Rent-A-Car.

Anheuser-Busch has its headquarters in St. Louis. As the leading brewer of beers in the U.S., its share of retail beer sales is almost 48 percent. PepsiCo and Coca-Cola also have facilities in the St. Louis area. Bunge North America, also headquartered in St. Louis, is involved in oilseed processing, edible oils and shortening, and corn milling. Its products include animal feed, breakfast cereals, snack foods, and bread. ICL Performance Products, a wholly-owned subsidiary of Israel Chemical Limited, is a leading producer of fertilizers and phosphate products for food and technical applications. Solae, another St. Louis-based global firm, is a joint venture between DuPont and Bunge that manufactures soy protein for beverages and meatless foods, as well as soy polymers for the paper industry. Firms such as these should prosper as they seek solutions to the challenges of developing more efficient ways to feed and fuel the growing global population.

Technical and Professional Services

Professional and technical services accounted for 12 percent of the new businesses formed in Missouri in 2013, continuing a three-year growth trend. Much of this growth took place in the metro areas, including the St. Louis region, which had over 40 percent of all new business formations in the state. St. Louis was 14th on the Forbes list of Best Cities for Young Professionals for 2013, surpassing Chicago, Dallas, and Raleigh. Forbes also noted that only five cities had more companies on its Best 400 Businesses and Best 400 Small Businesses lists. Fortune 500 companies are represented by Emerson Electric, Express Scripts, Anheuser-Busch, Ameren, Monsanto, Charter Communications, Peabody Energy, and Graybar Electric, all with headquarters in the St. Louis area. Other nationally known firms such as A.G. Edwards, Enterprise Rent-A-Car, and Edward Jones have a presence in the area. These firms hire employees from a broad range of skill sets including accounting, information technology, law, and marketing. In all more than 6,000 St. Louis area firms in the sector employed over 58,000 workers in the first quarter of 2014, an increase of 2.4 percent over the previous year.⁸ Jobs in professional and technical services are projected to have above average availability and wages.

Information Technology and Telecommunications

Telecommunications and IT are important sub-sectors of the technical and professional services sector for the St. Louis District. Information technology is one of seven growth industries targeted by the governor’s Strategic Initiative for Economic Growth task force in December 2010, and the state has invested in attracting and supporting businesses in the industry. The St. Louis Economic Development Partnership has focused on connecting IT professionals and encouraging both startup and established businesses to build on this critical sector. In the St. Louis region, the information technology sector is growing as partnerships develop between established industries including bioscience and healthcare, food technology and agricultural research, and advanced manufacturing. Boeing announced plans in June 2013 to open an information technology center at its St. Louis County

⁶ Federal Aviation Administration Aerospace Forecast: Fiscal Years 2013-2033 accessed at http://www.aiaaerospace.org/assets/FAA_2013_to_2033_Aerospace_Forecast.pdf

⁷ Cassell, Jonathan. “Rise of the Machines: Industrial Machinery Market Growth to Double in 2014.” IHS Technology, April 16, 2014.

⁸ MERIC. Top High Growth Industries for St. Louis Region, First Quarter 2014, at missouriconomy.org.

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location, bringing at least 400 IT jobs to the area,⁹ and Charter Communications, one of the nation's largest cable and internet providers, has its corporate offices in the city.

Transportation and Logistics

St. Louis boasts four major interstate highways (I-44, I-55, I-64, and I-70), as well as US-40, US-51, US-60, and US-67. The area is served by the Burlington Northern Santa Fe, Canadian National, Norfolk Southern, CSX, and Union Pacific railroads and is the third largest rail hub in the U.S. The Port of St. Louis is the busiest inland water port in the country. Lambert-St. Louis International Airport is the air cargo facility for the region, and it has a Foreign Trade Zone.

The St. Louis area is home to numerous distribution centers for companies including Aldi Foods, American Red Cross, Coca-Cola, Macy's, Rawlings Sporting Goods, SuperValu, SYSCO, Trane, and UPS, thanks to its strategic location and extensive freight infrastructure. Third party logistics companies include C.H. Robinson, Cheyenne Logistics, Exel, Fastrans Logistics, Graybar, The Hub Group, LMS, Materialogic, and World Wide Technology, and several of these are headquartered in St. Louis. Because of the continuing growth in this sector, laborers and freight, stock, and material movers is listed as one of the District's top growth occupations; 5,941 job openings are predicted between 2012 and 2022, an increase of 43 percent. The outlook for logistics professionals is also well above average, with 432 openings projected between 2012 and 2022—a 30 percent increase.¹⁰

Artur Express, an independent contractor trucking company, is expanding its headquarters in south St. Louis County. Other trucking firms include Hogan 1, Slay Industries, UniGroup Inc., and Witte Brothers Exchange Inc. But as of August 2014 a nationwide shortage of truck drivers means as many as 40,000 openings across the country are not being filled. Truck drivers are third on the list of ManpowerGroup's 2013 Talent Shortage Survey,¹¹ and freight stakeholders in the St. Louis region indicate that the shortage is an issue in the St. Louis area. East Central Community College in Union is one of six post-secondary institutions in the State that offer programs in truck driver training.

Importance of Freight to the Economic Development Future of the St. Louis District

Manufacturing and Exports

Manufacturing continues to be a vital part of Missouri's economy and exports of Missouri manufactured goods continue to increase. Missouri businesses exported over \$3 billion in goods by the close of the first quarter of 2014, and nearly \$13 billion in 2013.^{12,13} Four primary industries in the manufacturing sector accounted for over 62 percent of Missouri exports: transportation equipment, chemicals, food and kindred products, and machinery-related businesses. These industries exported over \$8 billion in products in 2013.¹⁴ Agricultural products, fabricated metal products, electrical equipment, minerals and ores, primary metal manufacturing, and computer and electronic products round out the top 10 exports from the state in 2013. Over 6,100 businesses in Missouri exported products and services in 2012, and 89.5 percent of Missouri's exports are manufactured goods produced in communities around the state. Manufacturing exports support nearly 107,000 jobs in the State, and 85 percent of the companies engaged in exporting goods and services are small businesses.¹⁵

Manufacturing matters in Missouri because:

- Employees in manufacturing firms earn an average of \$77,060 annually in pay and benefits, while average workers in all industries earn \$60,168. This means manufacturing jobs pay, on average, 19.9 percent more than non-manufacturing jobs.¹⁶
- Manufacturing firms account for nearly two-thirds of all research and development in the U.S. and are a leading user of new technologies and processes.¹⁷
- Manufacturing has the highest multiplier effect of any economic sector; for every dollar spent in manufacturing another \$1.48 is added to the economy, helping to stimulate economic growth.

⁹ "Global aerospace giant Boeing expected to add 400 jobs to St. Louis County location," June 17, 2013. Accessed at <http://governor.mo.gov/news>.

¹⁰ MERIC, "Top Ten Occupations by Projected Growth," at missourieconomy.org.

¹¹ Williams, G. Chambers, "Trucking industry faces uphill battle to recruit drivers," The Tennessean, August 25, 2014.

¹² WISER Export Trade data, 2014

¹³ U.S. Census Freight Trade State Exports, Missouri

¹⁴ Missouri Economic Research and Information Center, Missouri Department of Economic Development, March 2013

¹⁵ U.S. Department of Commerce, International Trade Administration, National Association of Manufacturing, 2013

¹⁶ Bureau of Economic Analysis, Industry Economic Accounts, 2011

¹⁷ Brookings Institute, Metropolitan Policy Program, "Why Does Manufacturing Matter?" February 2012

St. Louis District Profile

- Missouri's economy is intrinsically linked to its ability to move people, materials, components, and finished goods within the state and to national and international destinations.
- Missouri's principal trading partners are Canada, Mexico, China, Japan, and Korea.¹⁸ The five industries with the most significant job dependence on exports include grain farming, oilseed farming, wholesale trade, and aircraft manufacturing.
- Export products are intrinsically dependent on multimodal freight transportation.

Conclusion

The economy of the St. Louis District relies on diverse industries, from information technology, advanced manufacturing, and aerospace to more traditional sectors such as food and beverage processing and industrial machinery. The area is home to both established Fortune 500 companies and innovative startups, accounting for more than 40 percent of all new businesses in the State in 2013, and it ranked above Raleigh, Dallas, and Chicago on Forbes list of Best Cities for Young Professionals. The St. Louis area is working hard to maintain and grow its economy, and the outlook for many of its key industries is promising.

Central to its success is a reliable and efficient freight transportation system. As the largest inland river port and third largest freight rail hub, and with multiple Interstate and US highways, the region's freight infrastructure is critical to the economies of St. Louis and its surrounding counties, the State of Missouri, and the nation. As the level of freight flowing to, from, and within the region continues to increase, the infrastructure on which it depends must keep pace. Research in the U.S. and in other countries has shown that investment in physical infrastructure reduces costs and improves efficiencies in conducting business, boosts job creation, and fosters growth cycles within countries.¹⁹ Based on this research, maintaining the existing freight network—in all modes—and expanding both its capacity and its connectivity in ways that increase reliability and lower transportation costs for producers, shippers, and consumers will be crucial to the future prosperity of the St. Louis District.

¹⁸ US Census, State Exports, Foreign Trade, 2013

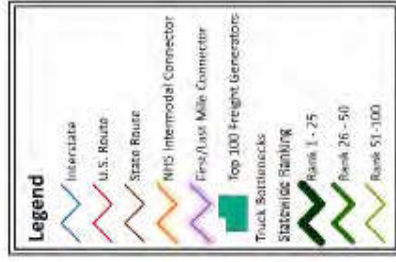
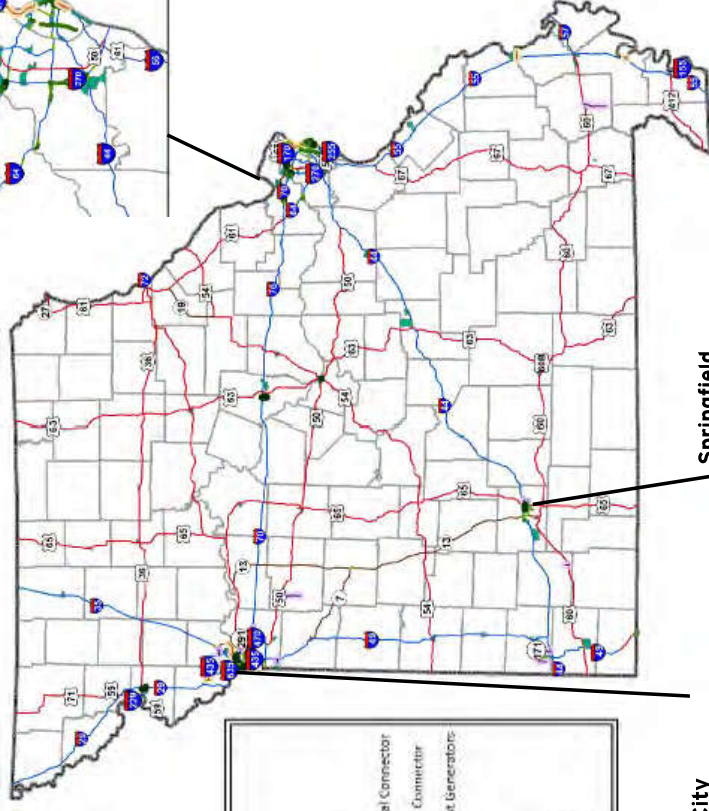
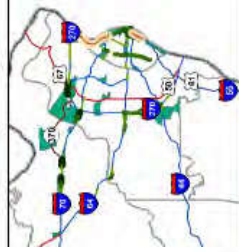
¹⁹ Deloitte LP and the Council on Competitiveness, "2013 Global Manufacturing Competitiveness Index."

Appendix I

Freight Modal Profiles

Missouri National Highway System >>

St. Louis



Kansas City



Springfield



A Vision for Missouri's Freight Transportation Future >>



Building on MoDOT's long range plan, which established the vision for Missouri transportation, and through collaboration with freight partners, MoDOT has developed a State Freight Plan. The plan describes Missouri's existing freight system, establishes goals and strategies for updating the system over the next 10+ years, and will guide future investments in transportation and prioritize freight projects that will provide the most economic benefits to the state.

Freight is a critical element in the Missouri economy and it's important to have a plan to make sure we keep freight – and the Missouri economy – moving smoothly. Missouri's freight transportation system is how products such as soybeans and aviation parts are transported around the world. Making smart investments can help to provide better options for Missouri businesses to get their products to markets. An improved freight transportation system can also lower transportation costs.

Trucks are, and will likely remain for the foreseeable future, the predominant mode for moving freight across Missouri due to their speed, reliability, and flexibility.

There are a number of critical issues and trends that offer both opportunities and challenges for freight movement on Missouri highways. These include funding for transportation and its impact on trucking costs; urban congestion and bottlenecks; labor issues; security requirements; size and weight restrictions, and their effect on efficiency; hours of service; cell phone usage; intelligent transportation systems; intermodal logistics centers and inland ports; and hub-to-hub trips vs. distribution trips.

Highways

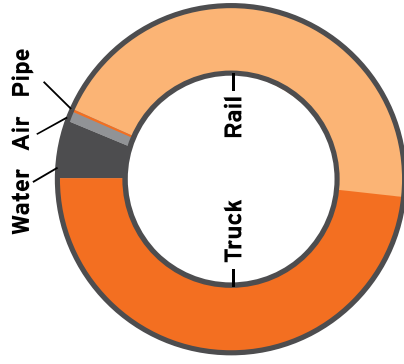
Highway System Fast Facts

- **7th largest highway system** in the country
- **33,700 miles of roadway** (5,500 miles classified as "major" highways and 28,200 miles classified as "minor")
- Major highways encompass just **20% of the state highway miles**, but **carry 80% of the traffic**
- There are **18 interstate highways in Missouri**, including 9 main routes and 9 auxiliary routes
- **Less than 1%** of all bridges in the state are considered **low vertical clearance bridges**, which means there are fewer obstacles to routes around the state resulting in a free flow of freight

For more information
www.MOFreightPlan.org
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 1-888-ASK-MODOT (275-6636)

3 top things to know about freight along Missouri's highways

Truck movements represented **49% of modal tonnage** in MO and **59% of total modal value** in 2011, the largest relative modal share



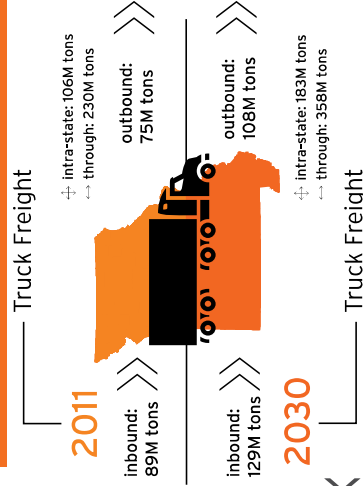
Missouri highway growth trends >>

- >> Truck tonnage is forecast to increase from 500 million in 2011 to 778 million in 2030, an increase of 55.5%.
- >> Truck commodity value is forecast to increase from \$70.9 billion in 2011 to \$12.2 trillion by 2030, a cumulative increase of 68.4%.
- >> Freight density growth expects greatest volume increases on I-44 and I-55. I-44, I-55 and I-70 will all be critical to freight growth.



1 Trucks move more freight than any other mode and it's only going to increase.

Tonnage forecast by direction, 2011-2030 >>



<<< 46% of truck freight tonnage is traffic passing through the state >>>

Total Truck Freight Growth by 2030:

+ 55.6%

inbound » + 44.6% outboard » + 44.0%
intra-state » + 72.9% through » + 55.5%

2 The highway system needs improvements to better handle freight now and into the future.

Top 5 highway system needs >>

- 1 Improved corridor capacity
 - 2 Eliminate bottlenecks (could be capacity or design issues)*
 - 3 Safety (truck parking, at-grade rail crossings, roadway design and geometrics)
 - 4 Connectivity to major freight generator sites
 - 5 A designated freight network is needed to help focus current and future freight investments
- * these bottlenecks are far less severe than those in other areas across the U.S.

88 out of the state's top **100 trucking bottlenecks** are located in **major metro areas**

Approximately **20% of all bridges** in the state are **load restricted**, which could create obstacles to the flow of freight in some areas

Key issues identified through regional forums >>

- >> I-70 is critical to freight movement
- >> Concern about lack of funding
- >> I-44 and US 36 are other top priority corridors
- >> Concern about north-south connections like US 63
- >> Capacity and maintenance improvements to maintain reliability
- >> Deficient bridges cause delays and safety concerns

3 The freight moving along Missouri highways is a valuable commodity.

Truck movements in 2011 totaled **500 million tons**, valued at **\$711 billion**

Top 5 highway system commodities >>

- 1 Nonmetallic minerals (such as coal, salt, clay, and marble) - 20.5%
- 2 Secondary traffic (mixed shipments of consumer goods generally going between warehousing distribution and retail locations) - 16.8%
- 3 Farm products - 16.4%
- 4 Food or food-related products - 11.5%
- 5 Chemicals or similar products - 8.4%

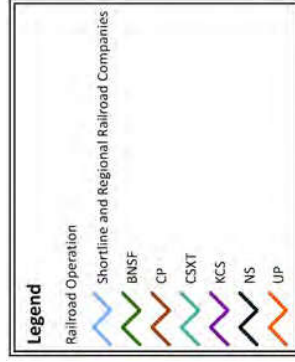
Missouri rail system >>



Kansas City



Springfield



Data Sources: MoDOT and ESRI

A Vision for Missouri's Freight Transportation Future >>



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Rail is, and will likely remain for the foreseeable future, the second most used mode for transporting freight in Missouri. With growth in the intermodal freight sector rail will continue to be an important connection between other modes of freight transportation. Currently Kansas City has the second largest rail hub in the country and St. Louis has the third largest rail hub.



Rail

Rail System Fast Facts

- **Six Class I** freight railroads operate **4,218 track miles**
- **Five short line railroads** operate **426 track miles** and **eight switching and regional railroads** operate **178 track miles**
- **Kansas City** is the country's **second largest** rail hub and **St. Louis** is the **third largest**
- Missouri has approximately **5697 public and private at-grade highway-rail crossings**
- Missouri ranks **10th in rail miles** and **4th in rail tons**

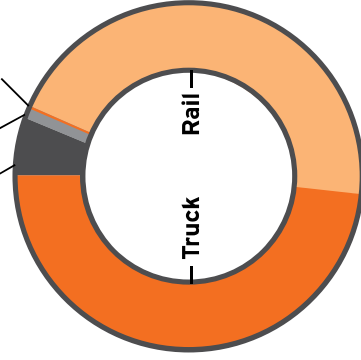
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3 top things to know about freight along Missouri's rail system



Rail movements represented **45% of modal tonnage** in Missouri and **39% of total modal value in 2011**, the second largest relative modal share.

Water Air Pipe



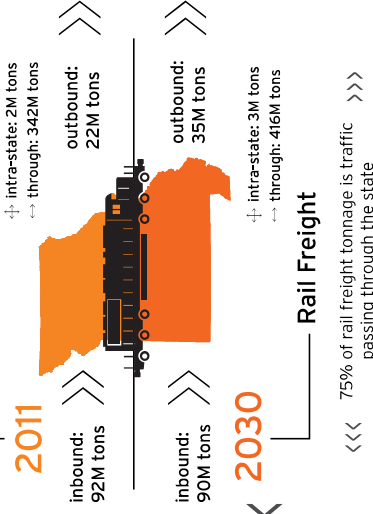
<<<<

1 Rail lines are the second most used mode for transporting freight and use will continue to grow.

>>

Tonnage forecast by direction, 2011-2030 >>

Rail Freight



Rail Freight

<<< 75% of rail freight tonnage is traffic passing through the state >>>

Total Rail Freight Growth by 2030:

+ 19.0%

Inbound » + 2.3% outboard » + 64.4%
Intra-State » + 32.9% through » + 21.8%

Missouri rail system growth trends >>

- >> Rail tonnage is forecast to increase from 458.1 million tons in 2011 to 545.2 million tons in 2030, an increase of 19%.
- >> Rail commodity value is forecast to increase from \$465.0 billion in 2011 to \$790.6 billion by 2030, an increase of 70%.
- >> The tonnage for inbound coal is expected to decline likely due to reduced usage for power plants.
- >> Greatest rail volume increase is expected on the BNSF line connecting Kansas City and Chicago.

Key rail issues identified through regional forums >>

- >> Dwindling rail presence in some areas of the state and the effect that reduction has on connectivity and economic development
- >> Aging Mississippi River rail bridge infrastructure in St. Louis
- >> Currently because of regulations and inspections, all refrigerated goods must be shipped through Kansas City, no matter the final goods destination. An inspection facility to meet the regulations is needed in St. Louis.

The rail system needs improvements to better handle freight now and into the future.

>>>>

Top 5 rail system needs >>

- 1 Reduce congestion and build capacity
- 2 Eliminate bottlenecks at the intersection of rail lines, particularly in Kansas City
- 3 Remove at-grade crossings, which are crossings where the railroad tracks and roadways meet at the same level
- 4 Encourage continued use of short line railroads to maintain connections for Class I Railroads and shippers and receives
- 5 Freight network designation to help focus current and future freight investments

Rail lines in Missouri >>

Class I Railroads in Missouri	MO Miles
BNSF Railway Company	1,759
CSX Transportation	13
Kansas City Southern Railway Co.	396
Norfolk Southern Corporation	409
Soo Line Railroad Co. (Canadian Pacific)	144
Union Pacific Railroad Co.	1,497
Total miles operated by Class I Railroad	4,218

Short Line Railroads in Missouri

Short Line Railroads in Missouri	MO Miles
Arkansas & Missouri Railroad (AMR)	33
Kaw River Railroad (KRR)	21
Missouri & Northern Arkansas Railroad (MNA)	331
Ozark Valley Railroad, Inc. (OVR)	33
South Kansas & Oklahoma Railroad (SKO)	8
Total miles operated by Short Line Railroads	426

The freight moving along Missouri rail lines is a valuable commodity.

3

>>>>>
Rail movements in 2011 totaled **458.1 million tons, valued at \$465.0 billion**

Top 5 rail system commodities, by tonnage >>

- 1 Coal - 48.9%
- 2 Food and food-related products - 8.6%
- 3 Chemicals or similar products - 8.3%
- 4 Miscellaneous mixed shipments - 8.1%
- 5 Farm products - 7.9%

Missouri ports and waterways network>>

A Vision for Missouri's Freight Transportation Future >>

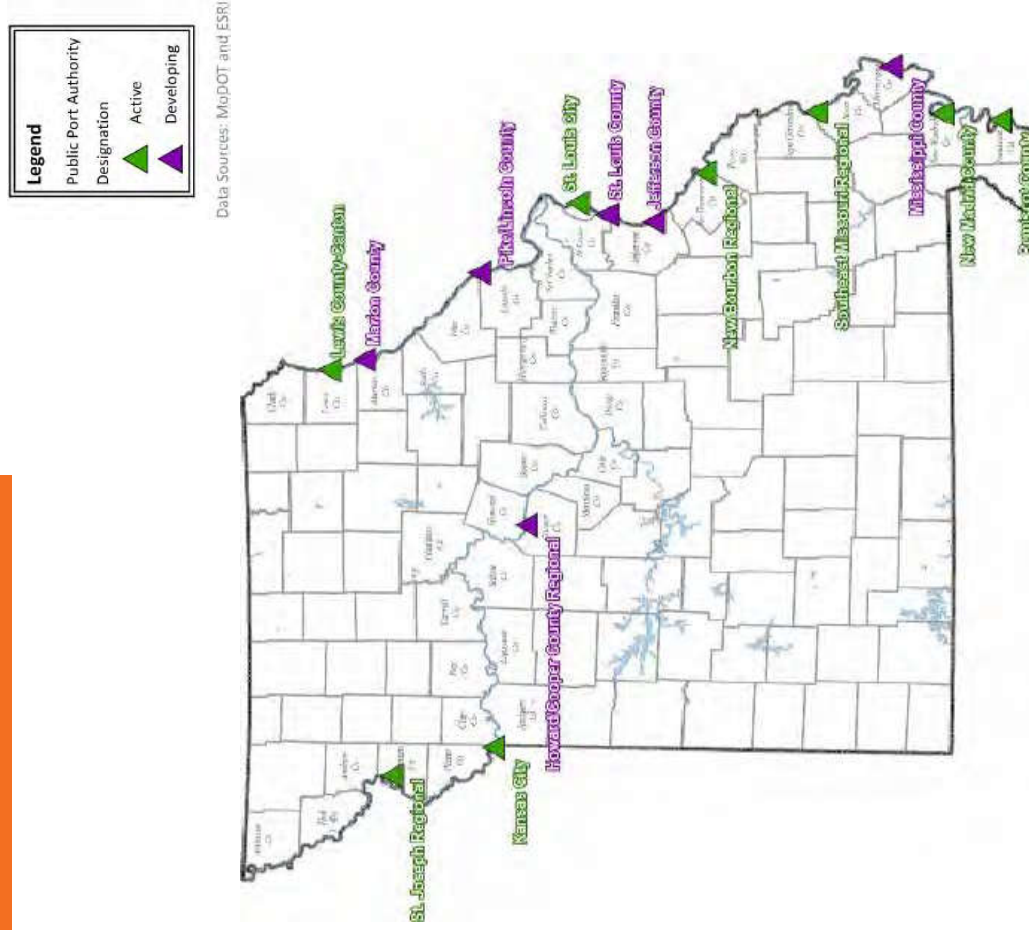


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Ports and waterways represent a relatively small share of the modal tonnage and value in Missouri, but there is opportunity for this to increase in the future. The potential for increased traffic is due to the Panama Canal expansion project which could increase freight movement on inland waters and the congestion and capacity issues with highways and rail.

Missouri is a major agricultural producing state. Agriculture products are the second highest commodity by tonnage moving through Missouri ports. Agriculture products account for 10.8 million tons which is nearly 22 percent of Missouri's port tonnage.



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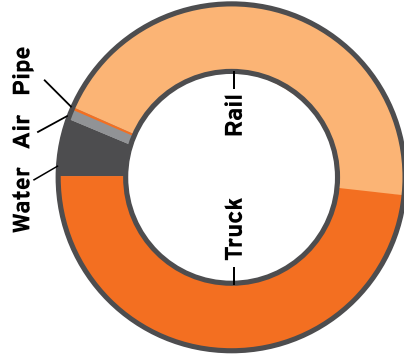


Ports and Waterways

Port and Waterways Network Fast Facts

- Missouri has **1,950 miles of navigable river**, including **500 miles** on the **Mississippi River** and **550 miles** on the **Missouri River**.
- Missouri has over **200 private ports** and **14 public ports**. There are different categories of public port authorities: active, inactive and developing ports. There are **six active public ports** which have shipped product within the last year. There are **three inactive public ports** which have a public port facility but did not ship product within the last year. There are **six developing public ports** which currently do not have a public port facility.
- There are **seven lock and dams** located in Missouri, all of which are located on the Upper Mississippi from St. Louis north to Iowa.
- The Missouri and Mississippi rivers are part of a large inland waterway network **directly connecting 15 states**.
- St. Louis, SEMO, Pemiscot and New Madrid are Missouri's most successful ports. **Port at St. Louis** is the **2nd largest inland port in the U.S. by trip-ton-miles** and **3rd largest by tonnage**.
- Missouri has **four marine highways**: M29, M35, M55, and M70.

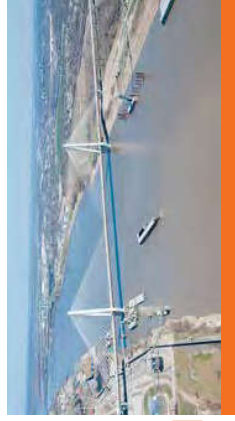
3 top things to know about freight along Missouri's ports and waterways network



Ports and waterways network growth trends >>

- >> From 2011 to 2030 it's forecast that the largest growth will be in intra-state (inside Missouri) and outbound water freight.
- >> Port tonnage is forecast to increase from 49.9 million in 2011 to 63.3 million in 2030, an increase of 26.9%.
- >> Port commodity value is forecast to increase from \$12.5 billion in 2011 to \$15.4 billion by 2030, an increase of 23.1%.

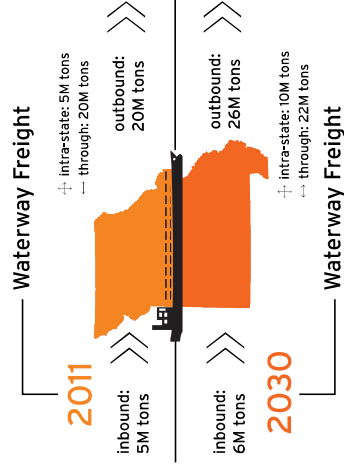
nearly **22%** of the State's port tonnage are agricultural products, making these products the second highest commodity moving through Missouri ports. Coal is the top commodity.



1 Port and waterway freight is forecast to increase in both tonnage and value.



Tonnage forecast by direction, 2011-2030 >>



Total Waterway Freight Growth by 2030:

+ 26.9%

Inbound » + 16.0% Outbound » + 29.8%

Intra-state » + 93.6% Through » + 10.2%

2 The ports and waterways network needs improvements to better handle freight now and in the future.



Top 5 ports and waterways system needs >>

- 1 Maintenance of both the land and water sides of operations
- 2 Upgrades and rehabilitation of locks and dams
- 3 Enhanced water flow for greater river level reliability, particularly on the Missouri River.
- 4 Support for development of emerging ports
- 5 Freight network designation to help focus current and future freight investments.



Key issues identified through regional forums >>

- >> Missouri River is under-utilized and could take strain off of highways and rail
- >> Low water levels are a concern
- >> Outdated locks and dams on upper Mississippi River
- >> Concerns about funding for ports
- >> Need consistent support for dredging

The freight moving through Missouri ports and along its waterways is a valuable commodity.

3

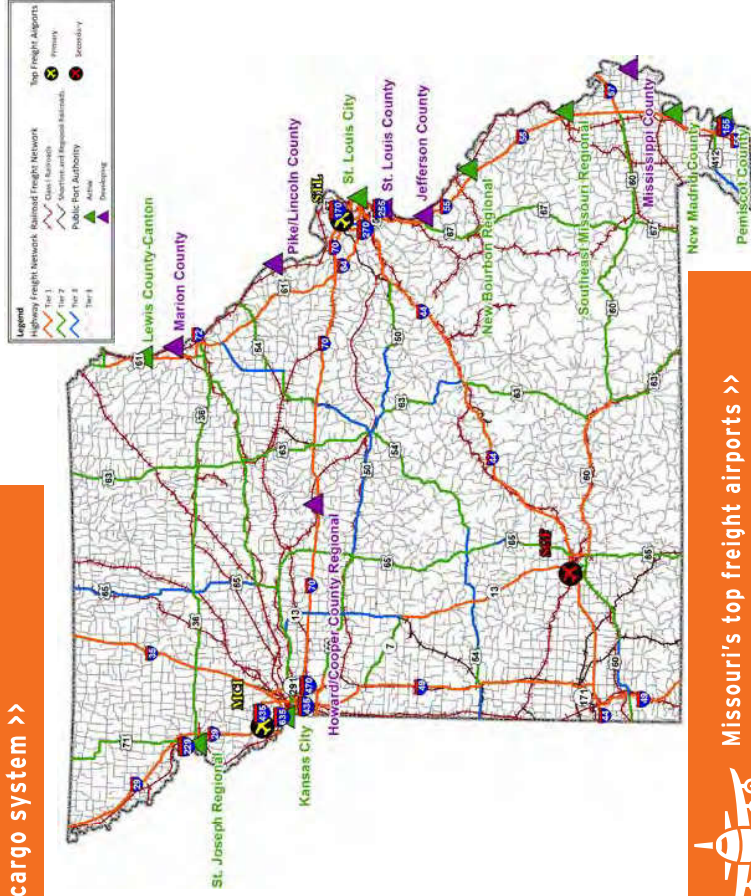
Missouri waterways provide low cost transportation and move an average of **\$12.5 billion in cargo per year.**



Top 5 ports and waterways network commodities >>

- 1 Coal - 25.3%
- 2 Farm products - 21.7%
- 3 Nonmetallic minerals (such as sand, rock, gravel and salt) - 17.6%
- 4 Chemicals or similar products - 9.2%
- 5 Clay, concrete, glass or stone - 8.6%

Missouri air cargo system >>



Missouri's top freight airports >>

ID	Airport Name	Associated City	Total Cargo Tonnage (2013)	2001-2013 % Change	North American Rank 2013
MCI	Kansas City International Airport	Kansas City	99,354 87,683 (2011)	-2.96%	37th Global Rank 2013: 152nd
STL	Lambert-St. Louis International Airport	St. Louis	64,557 69,209 (2011)	-5.18%	56th Global Rank 2013: 192nd
SGF	Springfield-Branson National Airport	Springfield	12,693 13,077 (2011)	0.95%	106th Global Rank 2013: 409th

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A Vision for Missouri's Freight Transportation Future >>



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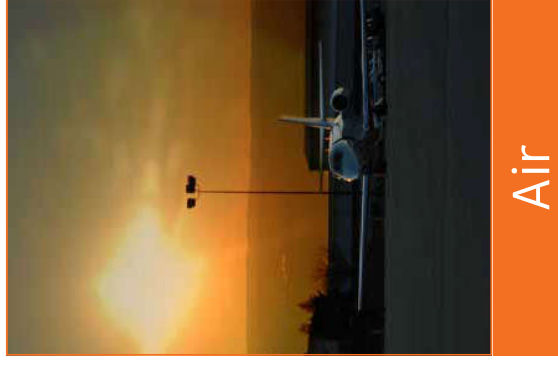
Air freight represents a relatively small share of the modal tonnage and value in Missouri. Air cargo is typically lightweight, time-sensitive and high value. The quantity of air cargo moving between origin and destination points is closely related to both airport capacity and airport infrastructure capacity.

Today's global economy is speed driven, and air cargo transports over \$6.4 trillion worth of goods, approximately 35% of world trade by value. [Source – International Air Transport Association (IATA)] Air cargo provides the ability to deliver small, light, compact, and high value commodities such as fresh produce, medications, and electronics internationally in a fast flexible manner.

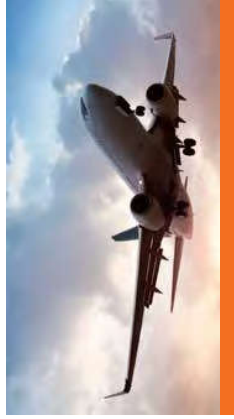
Air Cargo System Fast Facts

- **Three of the top 110 cargo airports in U.S./North America in total tonnage:** MCI (37), STL (56), SGF (106).
- **Kansas City International Airport (MCI)** is the **busiest airport** in annual air cargo tonnage and moves more cargo than any other air center in a six state region.
- **Proximity of MCI, STL, SGF to Foreign Trade Zones (FTZ)** allows businesses that utilize the zone to take **advantage of significant cost savings.**

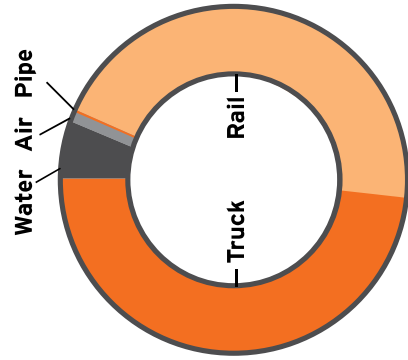
Air



3 top things to know about Missouri's air cargo system

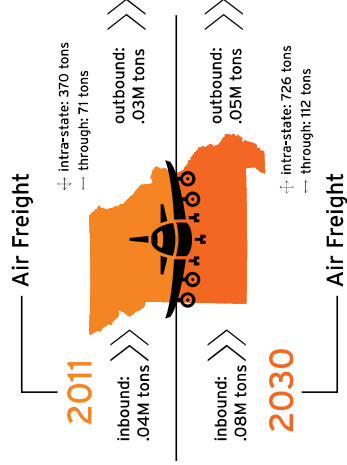


Air cargo movements in 2011 represent **less than 1%** of total modal value.



1 Air freight is forecasted to increase in both tonnage and value.

Tonnage forecast by direction, 2011-2030 >>



Total Air Freight Growth by 2030:
+ 90.8%
 inbound » + 119.8% out-bound » + 58.5%
 intra-state » + 96.2% through » + 56.8%

Missouri air cargo growth trends >>

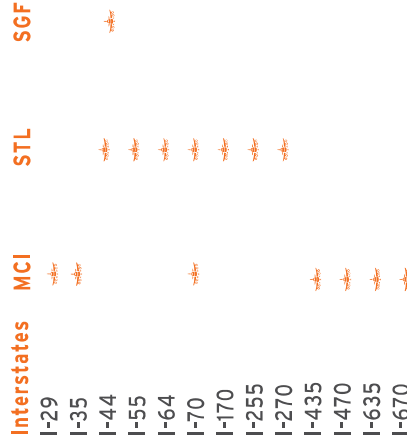
- >> Over the 2011 to 2030 future analysis horizon, outbound movements decrease while inbound increases.
- >> Air tonnage is forecast to increase from 73,003 in 2011 to 139,296 in 2030, an increase of 90.8%.
- >> Air commodity value is forecast to increase from \$11.4 billion in 2011 to \$27.5 billion by 2030, an increase of 141.8%.

2 The air freight system needs improvements to better handle freight now and into the future.

Top air cargo system needs >>

- 1 Upgraded freight facilities at STL
- 2 Maintained tower hours at SGF
- 3 Security and operations improvements at MCI
- 4 Freight network designation to help focus current and future freight investments.

Interstates in proximity cargo airports >>



Key air issues identified through regional forums >>

- >> Air cargo facilities are available at STL, but they are dated and small.
- >> SGF has been identified as an airport that may have its tower hours reduced. The desire is to maintain existing tower hours.

3 The freight moving by air is a valuable commodity.

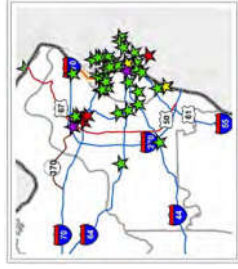
Air cargo in 2011 totaled over **73,000 tons**, valued at **\$11.4 billion**

Top 5 air commodities >>

- 1 Textile mill products (such as yarn and fabric) - 18.6 %
- 2 Transportation equipment - 13.5%
- 3 Electrical equipment - 12.8%
- 4 Printed matter - 10.1%
- 5 Miscellaneous manufacturing products - 9.1%

Missouri intermodal system network >>

St. Louis



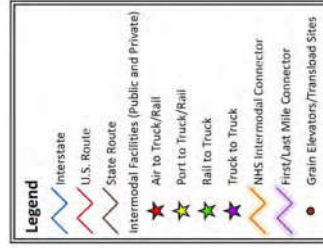
A Vision for Missouri's Freight Transportation Future >>



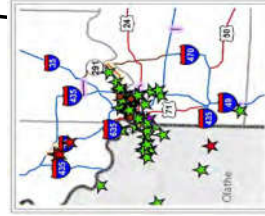
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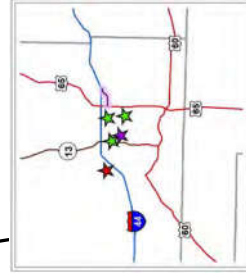
Data Sources: U.S. EIA, MoDOT, MoMDA, and ESRI



Kansas City



Springfield



Intermodal System

Intermodal System Fast Facts

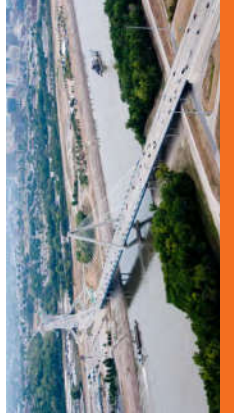
- **115 public and private intermodal facilities** located in Missouri
- **15 National Highway System (NHS) intermodal freight connectors** located in Missouri
- Majority of intermodal facilities **(71%) accommodate Rail-Truck** commodity transfers followed by modal transfers at **ports (16%) and airports (8%)**
- Majority of intermodal activity happens in metropolitan areas: **Kansas City (47); St. Louis (30); Springfield (6); and St. Joseph (4)**
- The **Kansas City metropolitan area is one of the largest rail freight and trucking hubs** in the country

Intermodal facilities are where freight is transferred from one mode to another, for example rail to truck or truck to barge.

The **intermodal system** in Missouri consists of intermodal facilities as well as intermodal connectors and first and last mile connectors, which are key roadways that connect the major intermodal facilities to the highway network.

For more information
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 1-888-ASK-MODOT (275-6636)

2 top things to know about Missouri's intermodal system



1 The Intermodal system is important to the timely, efficient and reliable delivery of goods and services.



One key component of Missouri's intermodal system are **first and last mile connectors**, which are key roadways that connect the major intermodal facilities to the highway network.

Last mile is a term used in supply chain management and transport planning to describe the movement of goods from a transport hub to a final destination in an area. Transporting goods via freight rail networks and container ships is often the most efficient and cost-effective manner of shipping. However, when goods arrive at a high-capacity freight station or port, they must then be transported to their final destination, usually by truck. This last leg of the supply chain is often less efficient, comprising up to 28 percent of the total cost to move goods.

The intermodal system in Missouri consists of:

- **115 Intermodal facilities**
- **15 National Highway System (NHS) designated intermodal freight connectors**
- **11 first/last mile connectors identified by MoDOT**

The 115 intermodal facilities in Missouri consist of rail-truck, port-truck/rail, air-truck and truck-truck connections.

Public roads leading to major intermodal terminals are designated NHS intermodal connectors by the U.S. Department of Transportation, in cooperation with state departments of transportation and metropolitan planning organizations. Several criteria are considered, including the level of activity of an intermodal terminal and its importance to a state's economy. **Although intermodal connectors account for less than one percent of total NHS mileage, they handle large volumes of trucks moving goods between terminals and the NHS or other modes.** Intermodal connectors also support defense mobilization and national security.

The intermodal system needs improvements to better handle freight now and into the future.

2



Key issues identified through regional forums >>

- >> Intermodal hub between Columbia and Jefferson City is needed to support economic development in the Central District
- >> Focus in St. Louis should be placed on developing opportunities for intermodal activities and international export
- >> Difficult to move freight from ports and airports directly to destinations. Better connectivity is needed between the freight modes
- >> A wide range of freight stakeholders, including trucking companies, railroads, and port authorities surveyed indicated that the presence of different freight modes is the greatest strength of Missouri's freight system
- >> Concern about lack of funding and flexibility of available funding

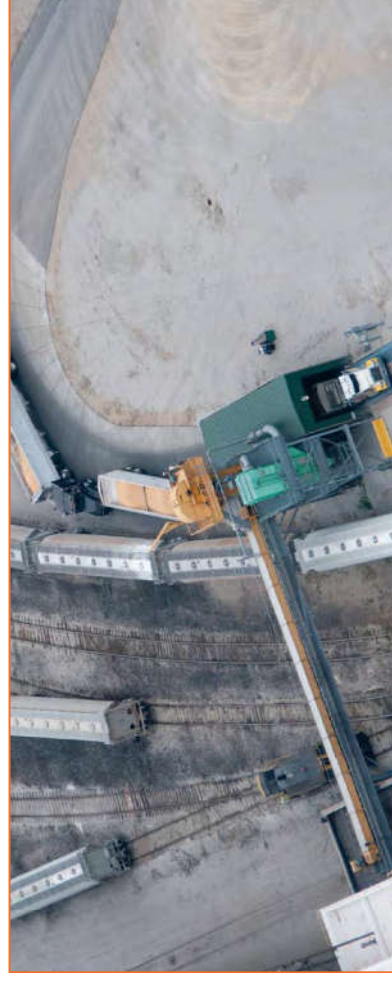
Top intermodal connector needs >>

1 New intermodal connection points are needed to help with logistics, costs and efficiencies which will improve Missouri's ability to compete domestically and internationally

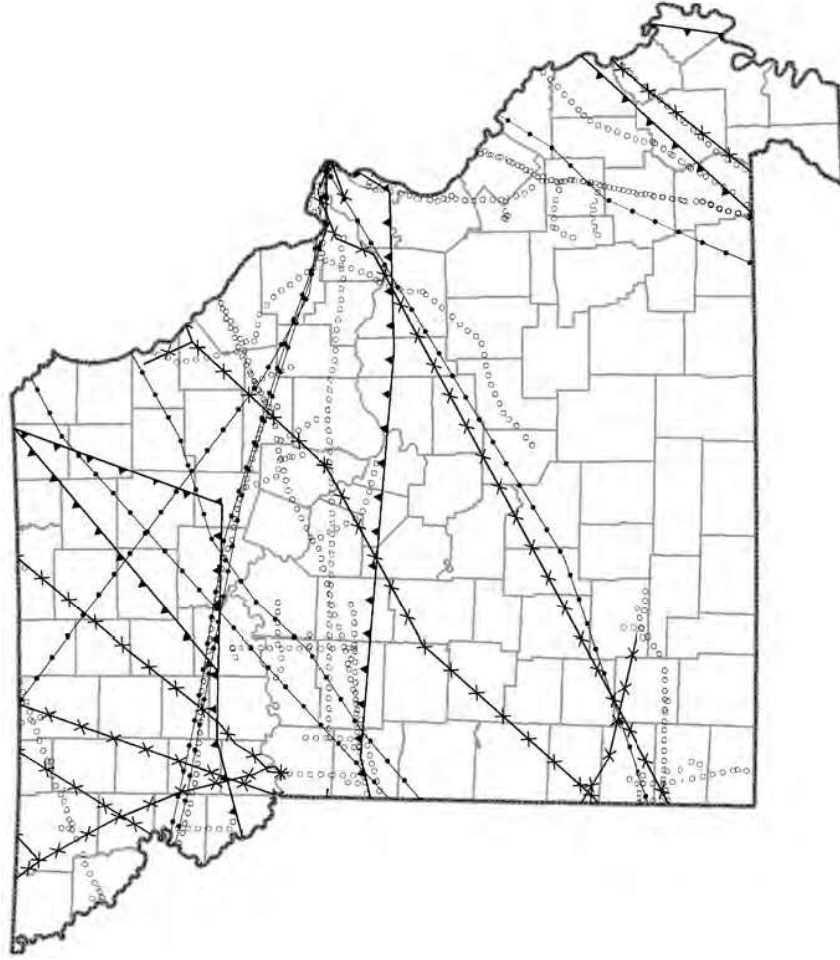
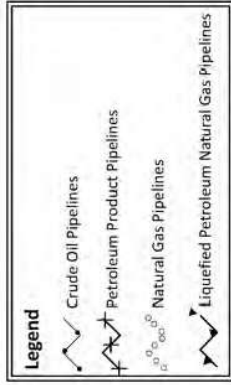
2 Improved intermodal connections at ports are needed

3 First/last mile intermodal connections need to be improved

4 A designated freight network is needed to help focus current and future freight investments



Missouri pipeline system>>



For more information
www.MOFreightPlan.org
www.MODOT.gov
 1-888-ASK-MODOT (275-6636)

A Vision for Missouri's Freight Transportation Future >>



Building on MoDOT's long range plan, which established the vision for Missouri transportation, and through collaboration with freight partners, MoDOT has developed a statewide Freight Plan. The plan describes Missouri's existing freight system, establishes goals and strategies for updating the system over the next 10+ years, and will guide future investments in transportation and prioritize freight projects that will provide the most economic benefits to the state.

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The Missouri pipeline system is privately owned and regulated outside of the Missouri Department of Transportation. The USDOT Pipeline and Hazardous Materials Safety Administration regulates pipeline transport.



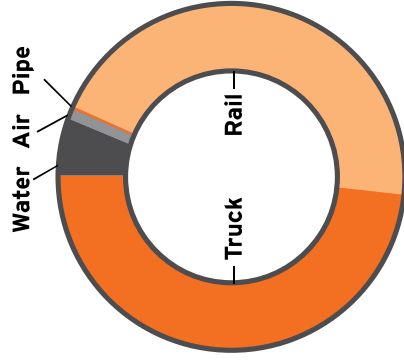
Pipeline

Pipeline System Fast Facts

- Approximately **10,700 miles of pipelines** move natural gas, crude oil and petroleum products throughout Missouri
- Highest percentages of pipeline miles are in **St. Charles County (4.9%), Cass County (3.6%), Audrain County (3.5%) and Johnson County (3.4%)**.
- Majority of major pipelines pass through the **northern half of Missouri**.

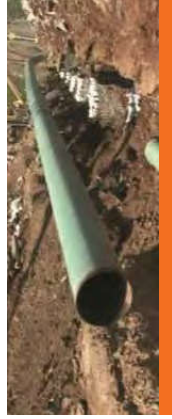
3 top things to know about freight along Missouri's pipeline system

Pipeline movements represented **less than 1%** of modal freight tonnage and **0.5% of total modal value** in 2011, the second smallest relative volume and the smallest value of all freight modes in Missouri.



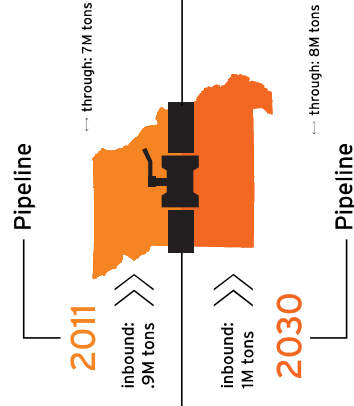
Pipeline system growth trends >>

- >> Pipeline movements (i.e. inbound, outbound, through) are expected to remain constant between 2011 to 2030.
- >> Pipeline tonnage is forecast to increase from 8 million tons in 2011 to 9 million in 2030, a cumulative increase of 6.5%.
- >> Pipeline commodity value is forecast to increase from \$5.8 billion in 2011 to \$6.1 billion by 2030, an increase of 6.5%.



1 Pipeline tonnage and commodity value is forecast to increase in both tonnage and value.

Tonnage forecast by direction, 2011-2030 >>



Total Pipeline Freight Growth by 2030:

+ 6.5%

inbound » + 6.6% through » + 6.5%

2 The pipeline system needs improvements to better handle freight now and in the future.



Several stakeholders discussed opportunities for future growth of the State's pipeline system.



Key issues identified through regional forums >>

- >> Concern about lack of funding for expanding the pipeline system
- >> Need to better engage private sector stakeholders to identify their specific pipeline issues

3 The freight moving through Missouri's pipeline system is a valuable commodity.

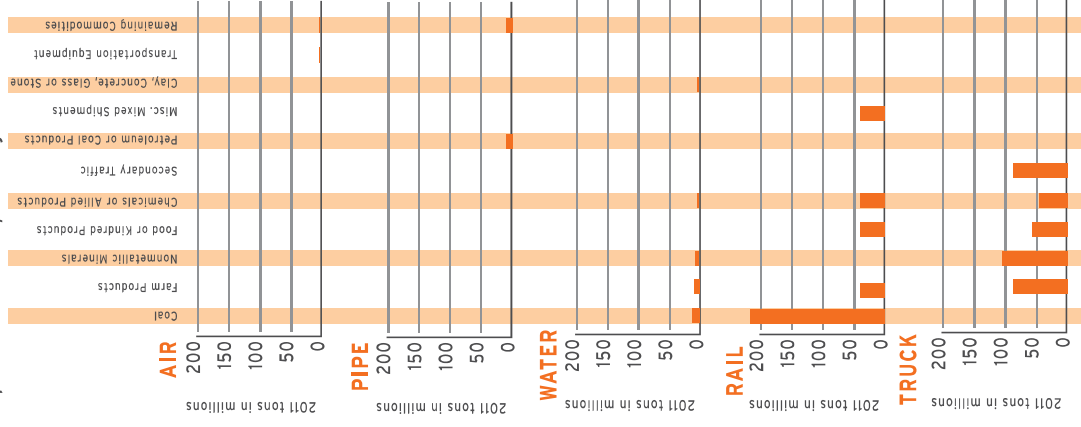


Top pipeline system commodities >>

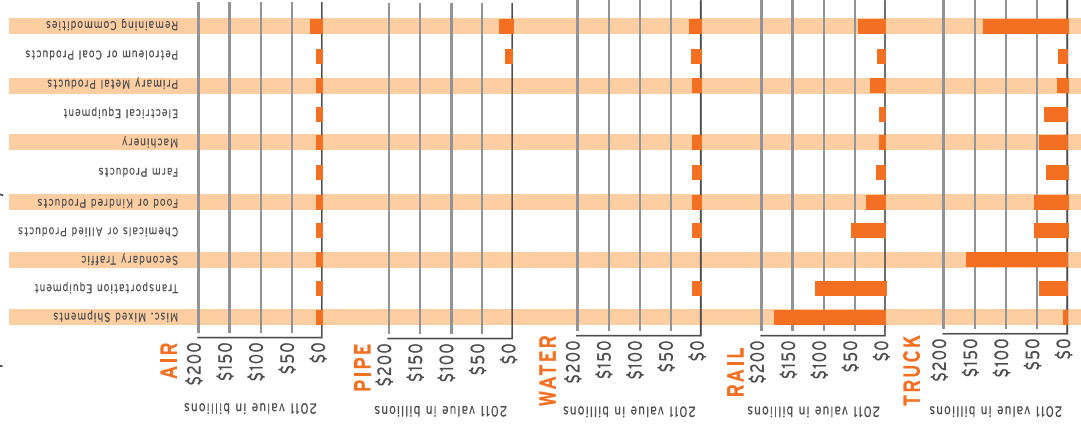
- 1** Crude petroleum and natural gas - 99.9% of all pipeline movements
- 2** Petroleum and gas products



Top Commodities by Tonnage and Mode



Top Commodities by Value and Mode



A Vision for Missouri's Freight Transportation Future >>



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The analysis of the type of freight commodities, a commodity's tonnage, a commodity's dollar value and the directional movement (into, out of, within or through Missouri) being transported help illustrate the importance of freight movements to Missouri from different perspectives. Each of these perspectives assists in estimating the economic impacts of freight movement.

Missouri is a bridge state, meaning that the majority of freight moving across the state's transportation network is truck- and rail-based through traffic. The main commodities are rail-based coal and truck-based secondary traffic (i.e., transportation of goods to additional locations between the point of origin and final destination, such as warehouses or distribution centers). It is projected that the dominance of through-based traffic will continue in the future, reinforcing the role of Missouri as a bridge state. Of the modes, truck carries the largest relative volume and value followed by rail; port, air, and pipeline combined, comprise a minority of freight movements.



Freight Commodities

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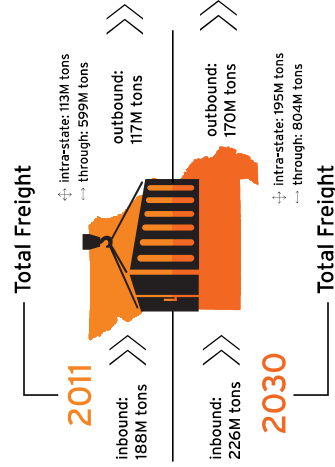
2 top things to know about freight commodities in Missouri



Much of the freight in the United States moves through Missouri due to its central location.



Total Freight Tonnage forecast by direction, 2011-2030 >>



Total Freight Growth by 2030:

+ 37.3%

Inbound » + 20.6% outbound » + 45.3%
intra-state » + 73.0% through » + 34.2%



Missouri's top freight commodities by tonnage, 2011 >>

Commodity	Tons (in thousands)	
	Amount	Percent
Coal	237,585	23.4%
Farm products	129,200	12.7%
Nonmetallic minerals (such as salt, clay, and marble)	123,662	12.2%
Food or food-related products	98,474	9.7%
Chemicals or similar products	84,647	8.3%
Secondary traffic (mixed shipments of consumer goods generally going between warehousing distribution and retail locations)	83,952	8.3%
Petroleum or coal products	47,132	4.6%
Misc. mixed shipments	37,592	3.7%
Clay, concrete, glass or stone	31,538	3.1%
Transportation equipment	19,410	1.9%
Remaining commodities	123,557	12.2%
Total	1,016,748	100.0%

Source: TRANSEARCH® data for 2011

Missouri's top freight commodities by value, 2011 >>

Commodity	Value	
	Amount	Percent
Misc. mixed shipments	\$189,344	15.7%
Transportation equipment	\$163,658	13.6%
Secondary traffic (mixed shipments of consumer goods generally going between warehousing distribution and retail locations)	\$161,694	13.4%
Chemicals or similar products	\$134,438	11.2%
Food or food-related products	\$99,907	8.3%
Farm products	\$57,608	4.8%
Machinery	\$57,147	4.7%
Electrical equipment	\$54,732	4.5%
Primary metal products	\$50,411	4.2%
Petroleum or coal products	\$42,095	3.5%
Remaining commodities	\$194,573	16.1%
Total	1,205,607	100.0%

Source: TRANSEARCH® data for 2011

There is a wide variety of valuable commodities moving across Missouri.

2



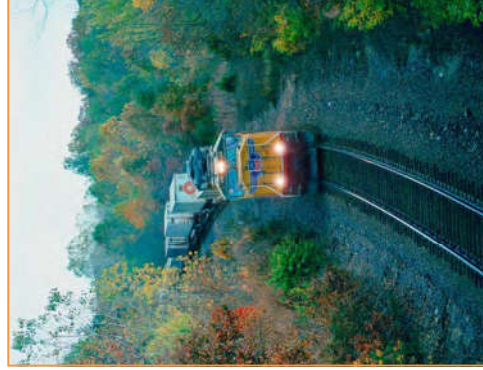
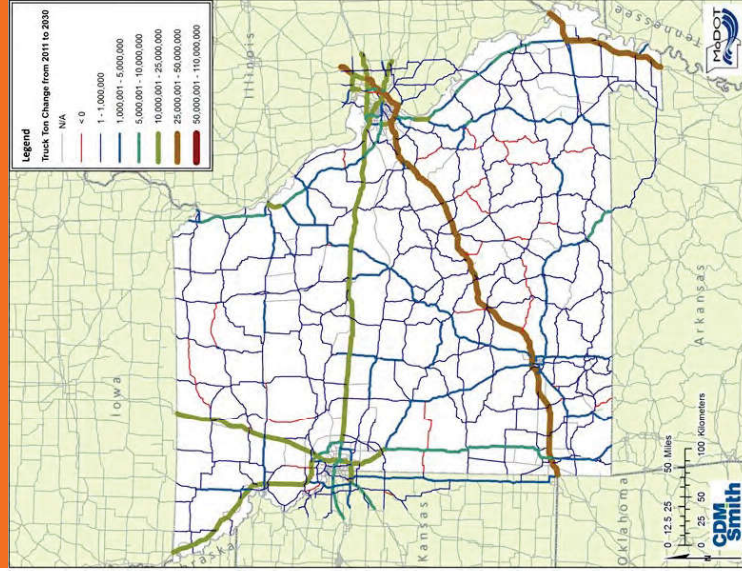
Rail Tonnage Growth, 2011 to 2030:

458 million tons » 545 million tons || +19%
2011 2030

Truck Commodity Value Growth, 2011 to 2030:

\$465 million » \$791 million || +70%
2011 2030

**Rail Density Growth,
2011 to 2030 >>**



A Vision for Missouri's Freight Transportation Future >>



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There is a close relationship between industrial health and vitality and transportation. Industries need parts and supplies to manufacture products (i.e., agricultural grains, food products and automobiles) that are then transported across Missouri, the country and the world. Transportation is responsible for bringing supplies into Missouri as well as exporting the products of Missouri industries.

Many of Missouri's exports have increased in the last decade. Exports of aircraft have double since 2009 and global demand for aircraft is expected to double over the next twenty years, which translates to significant business opportunities for the Missouri aerospace and aviation sector. Chemicals are Missouri's second largest international export, and the chemical industry employs over 17,000 workers. Missouri food and food ingredient exports have increased 148 percent since 2005. There has been an increased demand for U.S. agricultural products due to higher quality standards and greater variety. Export industries in Missouri account for 95,000 direct jobs.

All of these factors lead to a growth in freight movements in Missouri. In turn, the growth in freight movements will result in increased demands on the highways, rail lines, port facilities, and airports that handle freight.



Freight Trade and Growth

Freight Trade and Growth Fast Facts

- Missouri's population is expected to have an annual growth rate of 0.62% from 2012-2040, which **equates to over a million new Missourians.**
- Based on total truck and rail tonnages in 2011, Missouri's **top state trading partners are Wyoming, Illinois and Kansas.**
- The State's top international import/export trading partners are **China, Canada and Mexico.**
- In 2013, Missouri exports accounted for **almost \$13 billion and imports accounted for almost \$18.5 billion.** Both imports and exports account for .8 percent of the U.S. totals.
- Scheduled for completion in 2015, **expansion of the Panama Canal will double its capacity** which could reduce the costs of transporting via the Mississippi River.

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2 top things to know about freight trade and growth in Missouri



Missouri's role in freight trade results in economic development and jobs.



In 2012, export industries in Missouri accounted for **95,000 direct jobs** with aircraft and motor vehicles in the top three export gainers for both St. Louis and Kansas City.



Advanced manufacturing is one of the eight targeted industries Missouri Department of Economic Development continues to focus on. Nationally, continued growth in employment and investment in advanced manufacturing industries (e.g., pharmaceuticals) is occurring. These industries are expected to add an estimated **2 million jobs** over the next **10 years**. Advanced manufacturing industries in Missouri employed **175,396 workers in 2012 with an average annual salary of \$57,000**. Growth in this targeted industry sector is expected to continue to produce additional jobs with above average wages into the future.



Manufacturing productivity in the U.S. increased 73% between 1993 and 2011, contributing **\$1.87 trillion to the U.S. economy** in 2012. More than **60% of U.S. exports are manufactured goods**, and as new markets continue to open and global incomes continue to improve businesses stand to achieve even greater export-related revenues and profits.



Although direct manufacturing jobs have declined over the past two decades, indirect jobs in engineering, design, marketing, and finance that support manufacturing operations generate **68 cents for every dollar of manufacturing wages**. Today U.S. manufacturing accounts for 20% of the world's manufacturing output and U.S. manufacturing value-added is greater than that of China, India, Brazil, and Russia combined.



The most export dependent industries in Missouri (those industries that export 50 to 75% of production internationally) include: **mining machinery and equipment, communication and energy wire manufacturing, chemical manufacturing, measurement and calibration equipment manufacturing.**



The amount of freight moved and its value is forecasted to increase.

2



The largest truck freight density growth will occur on I-44 and I-55.

The greatest rail density growth will occur on the BNSF line connecting Kansas City and Chicago.



Truck Tonnage Growth, 2011 to 2030:
500 million tons » 778 million tons **|| + 56%**

Truck Commodity Value Growth, 2011 to 2030:
\$711 million » 1.2 billion **|| + 68%**

Truck Density Growth, 2011 to 2030 >>



Air Tonnage Growth, 2011 to 2030:
73 thousand tons » 139 thousand tons **|| + 91%**

Air Commodity Value Growth, 2011 to 2030:
\$11 million » 28 million **|| + 142%**



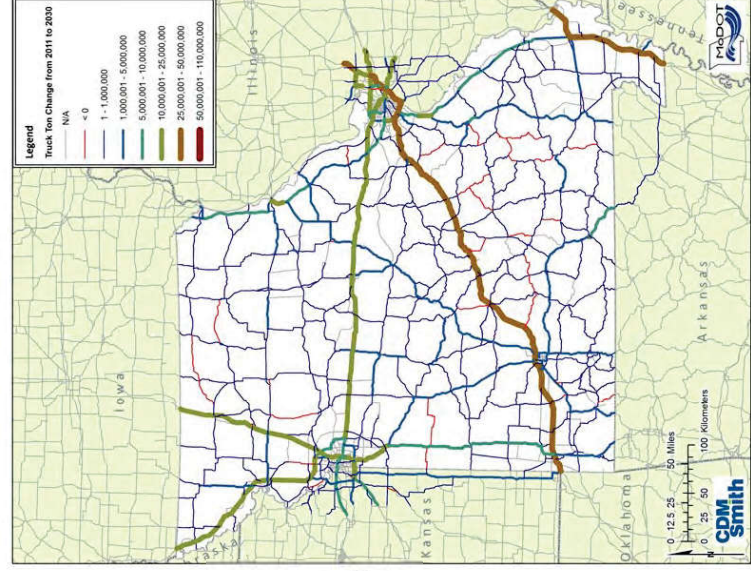
Port Tonnage Growth, 2011 to 2030:
50 million tons » 63 million tons **|| + 27%**

Port Commodity Value Growth, 2011 to 2030:
\$13 million » \$15 million **|| + 23%**



Pipeline Tonnage Growth, 2011 to 2030:
8.3 million tons » 8.9 million tons **|| + 7%**

Port Commodity Value Growth, 2011 to 2030:
\$5.8 million » \$6.1 million **|| + 7%**



APPENDIX J:

TOPICAL FREIGHT WHITE PAPERS

Intermodal Transloading

Airports

Port Investment in Container-on-Vessel Service

Intermodal Transloading

This white paper focuses on intermodal transloading and identifies terminals, warehouses, and other locations in Missouri where these activities take place. Because definitions vary, terminals, warehouses, private industries, and other locations involved in transloading do not always identify their facility as such. This makes it challenging to completely and accurately assemble a comprehensive listing of all transload facilities in Missouri.

What is intermodalism?

There are many and varied definitions of intermodalism, usually depending on the specific role an individual plays in the logistics process. An ocean vessel operator may focus his definition on containerized cargo transferred to rail or truck. In similar fashion, a rail company may define intermodalism as container or trailer on flat car. While each definition is correct, they represent only a single element of the overarching intermodal process. At the highest level, intermodalism can be defined as cargo that uses two or more modes as it travels from its origin to its destination.

At times the terms 'multimodal' and 'intermodal' are used interchangeably. However, some have distinguished these two concepts by the cargo packaging involved: intermodalism uses containers and multimodal describes bulk products. In the purest sense, the commodity or cargo packaging does not determine how many modes are used to transport cargo from origin to destination.

Intermodal cargo transfers

The Union Pacific (UP) Distribution Service Transloading 101 defines transloading as the transfer of cargo from one transportation mode to another or from one vehicle to another.¹ Three primary methods are used to transfer a load of cargo between rail and truck modes: direct transfer, cross docking, and transloading. Each of these transfer types is discussed below.

- **Direct transfer:** As the name implies, in a direct transfer the cargo is transferred directly from one mode to another. For example, a container is moved from a rail car to a truck chassis for over-the-road transport, or from a truck to a rail car. Direct transfer also applies to bulk commodities. Conveyor systems are used for dry bulk commodities such as grain and coal, while pumping is used for wet bulk commodities including petroleum and liquid fertilizer as shown in Figure J-1.

Figure J- 1: Example of Direct Transfer of Wet Bulk Product



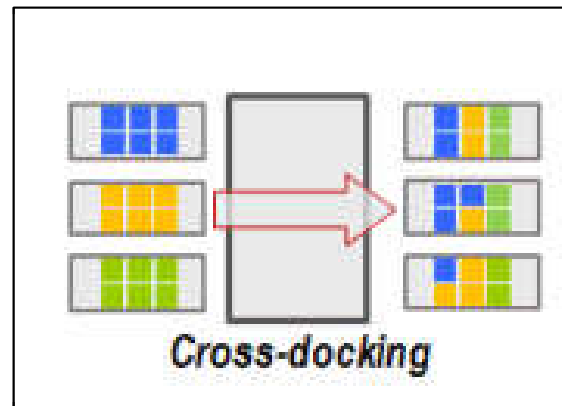
Source: www.uprr.com, Union Pacific Distribution Services, "How Transloading Works," website accessed July 22, 2014.

¹ Union Pacific, 2008

Appendix J: Topical Freight White Papers

- **Cross docking:** This method is generally associated with warehousing or distribution centers. The inbound cargo can arrive by truck or rail car, typically carrying a single commodity. The cargo is transferred directly to an outbound vehicle or to a staging area for loading. Generally the cargo leaves the warehouse or distribution center less than 24 hours after its arrival. Retail stores commonly use cross docking for deliveries to individual retail outlets to minimize inventory costs in association with just-in-time delivery. The process is most commonly used to transfer cargo from an inbound container, railcar, or truck to outbound trucks for distribution. While the example in **Figure J-2** illustrates the directional movement described above, the reverse flow can also be used for product returns.

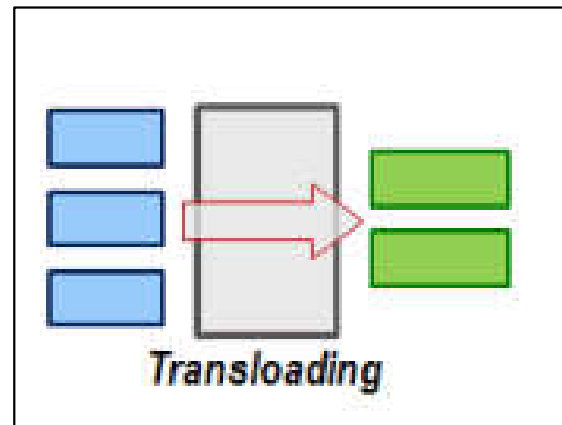
Figure J- 2: Illustration of the Cross Docking Process



Source: <https://people.hofstra.edu>

- **Transloading:** Like cross docking, transloading typically occurs at a warehouse or distribution center. A common example is when three 40-foot international containers arrive by railcar and are repackaged on two 53-foot trailers for inland distribution.² Transloading, like cross docking, does not include warehousing or storage of the products. Transloading typically adds a day to the overall transit time; however, it often involves value-added activities such as bulk breaking, repackaging, labeling, and palletizing deck laden cargo.³ Transloading can consolidate smaller shipments or divide shipments, as desired by the shipper. **Figure J-3** provides an illustrated example.

Figure J- 3: Example of Transloading Process



Source: <https://people.hofstra.edu>

Missouri rail-truck transloading locations

Table J-1 shows the rail-truck transfer locations, rail company-identified transload facilities, and bulk transload terminals in Missouri. If the broad definition of transload--the transfer of a load between vehicles--is used, there are 31 registered grain elevators in the regional directory.⁴ Many more local grain elevators potentially fall within this definition, but do not consider their facility a transload facility since they simply consolidate truckloads of agricultural products into railcars. However, eight Missouri transload facilities are identified by Class I railroads such as Burlington Northern Santa Fe (BNSF), Union Pacific (UP), and Canadian Pacific (CP). The eight sites identified by these railroads are listed in **Table J-1**.

² Hartley, 2013

³ Ibid

⁴ Grain Elevator Directory, 2014

Appendix J: Topical Freight White Papers

TABLE J-1: CLASS I RAILROAD TRANSLOAD FACILITIES IN MISSOURI

CLASS I RAILROAD TRANSLOAD FACILITIES IN MISSOURI

Facility Name	Warehouse	Bulk	Dimensional*	City
Aftton Terminal Services	Yes	Yes	Yes	St. Louis
Burlington Junction Transloading	Yes	Yes	Yes	Fenton
Kinder Morgan Operating	Yes	Yes	Unknown	St. Louis
Metro Park Quebec	Yes	No	No	North Kansas City
Midwest Reload	Yes	No	Yes	Kansas City
Queen City Warehouse	Yes	No	No	Springfield
Watco Terminal and Port Services	Yes	No	Yes	St. Louis

*I-beams, metal wire rolls, lumber, baled paper products, pipe, etc.)

Sources: www.bnsf.com, www.uprr.com, www.cpr.ca

Aftton Terminal Services⁵ - Since its beginning as a single truck operation, the company has grown to offer intermodal, pneumatic tank, van, and flatbed rail services. Transload capabilities include truck to truck, truck to rail, and rail to truck product transfers. The facility offers warehousing and outdoor storage with convenient highway access. The full service depot offers gate inspections and loaded lifts.

Burlington Junction Transloading⁶ - This gated facility provides rail to truck and truck to rail transloading in Fenton and serves the St. Louis metro area. The facility offers warehousing and outdoor storage with convenient highway access. In addition to bulk product transfers, railcar ramps are available for machinery and product loading and unloading. Crane and rigging services are also available.

Kinder Morgan Operating⁷ - This company has two facility locations in St. Louis. One is a warehouse and outdoor storage area providing rail, truck, and water interaction. Transload services noted on the website include cross docking and specialized packaging for both liquid and dry bulk items. Other commodities handled include food, medical-grade material storage, paper products, lumber, wall board, chemicals, auto parts, and general merchandise. The second location is a liquid facility providing interactions between rail, truck, and water modes with direct transfer capabilities between truck and rail. Primary commodities loaded through this facility include chemicals, clay, and methanol.

Metro Park Warehouse on Quebec⁸ - Metro Park Warehouse has six facilities in the Kansas City area with rail service. The warehouse provides rail and truck modal interactions for dry and food grade items with a temperature-controlled warehouse. Potential cross docking activities at this location are similar to those at other facility warehouses. Commodities moved through their warehouses include food and beverage sector products.

⁵ Aftton Trucking, 2014

⁶ Burlington Junction Transloading, 2014

⁷ Kinder Morgan Operating, 2014

⁸ Metro Park Warehouse, 2014

Appendix J: Topical Freight White Papers

Midwest Reload⁹ - Midwest Reload has two locations in Kansas City. Their facilities offer outdoor and climate-controlled warehousing, and lift equipment is capable of handling up to 15,000 pounds. Their website noted bulk commodities and construction materials.

Queen City Warehouse¹⁰ - No website was found for the Springfield location. The parent company offers warehousing for small customers - even a single pallet - with some trucks used for local pick-up and delivery. The Springfield location has a direct rail spur.

Watco Terminal and Port Services¹¹ - The facility has 122 acres and up to 40 rail cars. This facility has lift capacity of up to 36,000 pounds as well as rigging equipment. Although not tied to a specific terminal location, the website notes product consolidation and de-consolidation, transloading, and storage services. Products they handle include lumber, steel products, ingots, paper, auto parts, construction materials, dry bulk, and any palletized material.

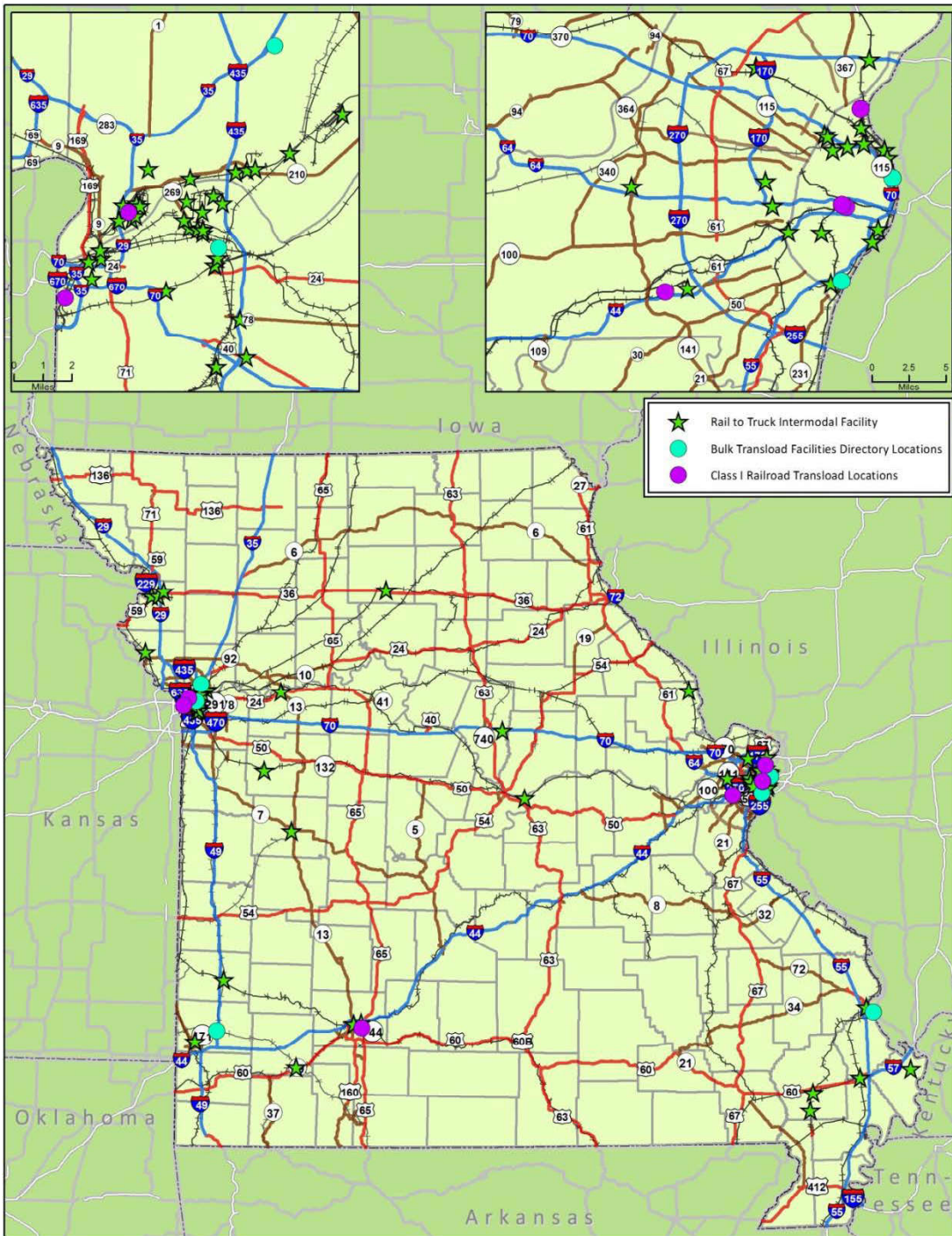
⁹ Midwest Reload, Inc., 2014

¹⁰ Queen City Warehouse, 2014

¹¹ Watco Terminal and Port Services, 2014

Appendix J: Topical Freight White Papers

Figure J-4: Missouri Truck-Rail Transfer Facilities.



Source: CDM Smith

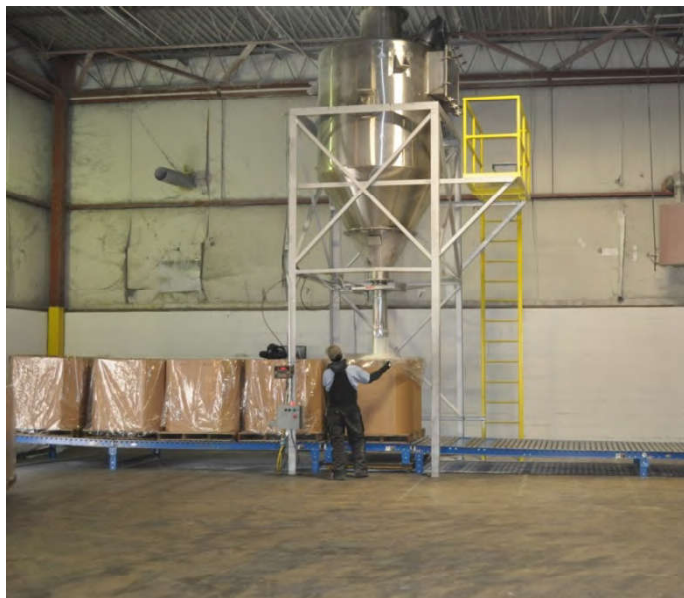
Appendix J: Topical Freight White Papers

Figure J- 5: Direct Transfer of Dry Bulk



Source: www.bakerfieldqdc.com

Figure J- 6: Example of Repackage Service.



Source: www.peoplesservices.com

Appendix J: Topical Freight White Papers

In addition to the railroad's transload facility listings, bulktransporter.com includes a bulk transload directory. It is unclear if this is a free or paid membership site, but in either case it likely does not offer a complete list of bulk transload facilities. The directory of Missouri facilities includes those listed in **Table J-2**.

TABLE J-2: MISSOURI DRY BULK FACILITIES

MISSOURI DRY BULK FACILITIES

Facility Name	Products	Services	Dry transfer type	City
Buesing Bulk Transport, Inc.	Dry chemicals Dry foods Dry plastics	Air compressor Scale	Vacuum trailer Blower	Carthage
Liquid Transport Corp.	Acids Liquid chemicals Dry chemicals Dry plastics Petroleum products	Air compressor Scale Sampling services Hot water heating Steam heating Tank trailer cleaning	Vacuum trailer	Liberty
Quality Transload	Liquid chemicals Dry chemicals Dry foods Dry plastics	Scale Sampling services	Vacuum trailer Blower Portable vacuum/ air conveyor	Kansas City
Truck Transport, Inc.	Acids Liquid chemicals Dry chemicals Liquid foods Dry foods Dry plastics	Air compressor Scale Liquid pumps	Vacuum trailer Auger Blower Portable vacuum/ air conveyor	St. Louis
SEMO Port	Dry chemicals Dry foods Dry plastics	Scale	Auger Bulk conveyor	Scott City

Source: <http://bulktransporter.com>

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A third list of transload facilities at www.transload.org also includes Missouri locations. This list includes the member companies of the Transload Distribution Association, as shown in **Table J-3**. There is some overlap between the companies on this and previous lists. Because this listing only includes a member firm's name, telephone, and city, these facilities are not specifically identified in **Figure J-3**. All are in the major metropolitan areas of St. Louis and Kansas City or at the SEMO Port in Scott City.

TABLE J-3: MISSOURI MEMBERS OF TRANSLOAD DISTRIBUTION ASSOCIATION

MISSOURI MEMBERS OF TRANSLOAD DISTRIBUTION ASSOCIATION

Facility name	City
Reload Central, Inc.	Kansas City
Siegert Transportation Services, Inc.	Kansas City
MWT Bulk Services, LLC	Kansas City
Transload Services, LLC	Kansas City
Wagner Industries, Inc.	North Kansas City
Roll and Hold/ADS Logistics, LLC	O'Fallon
SEMO Port	Scott City
Aftton Trucking Company	St. Louis
Cahokia Marine Services	St. Louis
Reload MO, Inc.	St. Louis
Savage Services (2 locations)	St. Louis
Slay Industries Bulk Terminal (2 locations)	St. Louis
Transload Services, Inc.	St. Louis
Watco Transload	St. Louis

Source: www.transload.org

Missouri ports

Missouri ports can also be transload sites as product is collected from a number of rail cars or trucks and combined for an outgoing load or divided into smaller rail cars or trucks for inbound commodities. Similar to truck and rail modes, transloading does not include warehousing or storage of the products. Ports are a natural transload site due to the size of barges versus landside truck and rail car transportation options that necessitate value-added activities such as consolidating smaller shipments or dividing shipments, as desired by the shipper.

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Summary

Transloading operations provide increased flexibility and cost savings for customers who do not have direct access to rail, or who need additional warehouse space on a short term or longer term basis. Transloading facilities enable customers to realize the cost savings in using rail freight by shipping via rail and utilizing local or short haul trucking services for “last mile” deliveries. This allows non-rail-served companies to use rail for some portion of their goods shipment, helping to reduce highway congestion and decrease maintenance costs on the state’s highway system. The availability of transload services can improve the competitiveness of non-rail-served businesses and improve time-to-market deliveries as well as costs.

Transload facilities should be designed to:

1. Enhance economic development and economic competitiveness
2. Improve costs for shippers and increase flexibility to meet customers’ time-to-market commitments
3. Optimize safety and security for customers
4. Provide equipment for material handling for various commodities, depending on the needs of regional customers

The needs of different commodity groups will vary. Determining the operating criteria and development needs of a facility that provides services for specific commodities requires expertise in and an understanding of facility design and operational considerations. While every transload facility will not provide exactly the same services or development features, these facilities are important to the state’s economic competitiveness and are particularly valuable to non-rail-served industries. Facility design, frequency of service, material handling equipment, and building and site layout are critical to the successful operation of such facilities and the value they bring to the businesses they serve.

AIRPORTS

This white paper focuses on small and non-hub commercial service airports in Missouri and the challenges and strategies to sustain airport facilities and enhance economic development.

The U.S. aviation industry has changed dramatically in recent years. The events of September 11, 2001, reduced passenger demand and slashed revenues, forcing the major air carriers to re-evaluate their business models and find new ways to remain profitable. Many of the airlines' cost-cutting measures have disproportionately affected regional airports; carriers have reduced or eliminated flights from smaller airports to key destinations, and—often as a result of mergers and consolidations—some regional airports have seen carriers pull out altogether. Because the businesses that generate economic growth depend on air transportation to ship goods to consumers; deliver raw materials and components; accommodate business, leisure, and tourism travel; and support critical jobs, these changes can seriously impact regional economies.

But there are steps communities can take to try to overcome these challenges. Faced with declining passenger numbers, shrinking destinations, and fewer carriers, several smaller airports and the communities they serve have succeeded in attracting new airlines, reinstating flights to popular destinations, and restoring critical services. Even more important, some cities have capitalized on their airports and created cargo hubs that have become key assets in recruiting new businesses, helping existing industries to expand and bringing new jobs and additional revenues to the community. Air cargo is a growing source of revenue for major airlines, integrators such as Fed Ex and UPS, and all-cargo airlines. The sections below summarize the challenges faced by Missouri's small hub and non-hub regional airports, and best practices utilized at other airports to try to ensure their airports continue to contribute to a strong and vibrant economy for the region and the State.

Aviation and the economy: U.S. and Missouri

More than 19,800 general aviation airports and commercial service airports in the U.S. contributed to a 12 percent increase in economic output from 2009 through 2012. Aviation facilities connect business and leisure passengers and freight to domestic and international destinations, providing access to an increasing number of markets and a broad array of customers and raw material resources and enhancing economic prosperity in the U.S. and around the world. According to the Federal Aviation Administration, in 2013 U.S. air carriers transported over 837 million passengers, moved more than \$61 billion revenue ton-miles of freight, and supported over 11.8 million jobs and \$1.5 trillion in economic output.^{12,13}

In Missouri, nine commercial service airports and 99 publicly owned, public use general aviation airports provide aviation services to businesses and passengers around the State. In 2012, Missouri airports generated \$11.1 billion in economic output and employed 100,000 people.¹⁴ The State's two largest airports, Kansas City International and Lambert-St. Louis International, accounted for nearly 92 percent of the State's direct airport jobs and 93.5 percent of its total aviation economic output. The State's third largest airport in terms of jobs, payroll, and economic output, Springfield Branson National, supported 4,454 total jobs and \$402,017,000 in economic output in 2012.

In addition to the economic benefits generated by the movement of goods and people, the U.S. aerospace industry continues to be a major employer and exporter, contributing \$118.5 billion in export sales and generating more than 1.2 million jobs for aerospace engineers and scientific and technical specialists as well as machinists and manufacturing technicians.¹⁵ The aerospace sector is projected to experience continued growth through 2023, due to increased global passenger travel demand and the replacement of older, obsolete airplanes with newer, more fuel-efficient models. Demand for new commercial aircraft is expected to generate record production levels of airplane and aviation components for the next 20 years. By 2023 commercial aircraft production levels are projected to increase by approximately 25 percent.¹⁶

¹² Federal Aviation Administration. "The Economic Impact of Civil Aviation on the U.S. Economy," 2014

¹³ "The Economic Impact of Commercial Airports," prepared for Airports Council International North America by CDM Smith, 2011

¹⁴ "Missouri Statewide Airports Economic Impact Study," by Landrum and Brown, Inc. for MoDOT Aviation Section, 2013

¹⁵ U.S. Department of Commerce, "The Aerospace Industry in the United States," Select USA, 2013

¹⁶ Deloitte Industry Sector Analysis Report, "2014 Global Aerospace and Defense Industry Outlook"

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While demand for commercial aerospace production continues to grow, U.S. spending for defense aviation has declined. Boeing's manufacturing facilities in St. Louis, which produce jets for the Department of Defense, were expected to cease operations by the end of 2017 until the recent announcement that parts for the Boeing 777X jet would be manufactured in the firm's St. Louis composites facility. This represents the first commercial jet production in St. Louis, and will increase Boeing's employment in the State by 770. Boeing currently employs 15,000 in the St. Louis region and is the State's largest manufacturer and third largest employer. Problems with out-sourced original equipment manufacturers have plagued the new Boeing 778 passenger aircraft, increasing expectations that some new aircraft original equipment manufacture (OEM) production may be returned to internal operations. This could bring additional aerospace manufacturing to Missouri.

Challenges facing small and mid-sized commercial service airports

Although the production of aircraft and aviation components is expected to increase over the next decade, the airline industry has faced serious financial and operating challenges over the past 10 years—largely the result of volatile fuel prices, the recession and slow economic recovery, and the continued consolidation of major U.S. carriers. The profitability of airlines has declined, and the industry has changed its principal business model to focus on efficiency and network management rather than on the efforts to expand market share it pursued in the previous decade. In an attempt to improve financial viability, major airlines have reduced the number of daily domestic flights in most markets. The 29 largest commercial airports in the U.S. realized a nearly nine percent reduction in scheduled domestic flights from 2007 to 2012. Small and mid-sized airports lost, on average, 18 to 26 percent of their regularly scheduled flights during the same period.

The reduction in scheduled flights has hit airports classified as mid-sized the hardest; these include airports in cities such as Cincinnati, Memphis, San Jose, and Pittsburgh. According to a recent study by the MIT International Center for Air Transportation, the two medium hub airports in Missouri, Kansas City International and Lambert St. Louis International, experienced a 30.2 and a 27.2 percent reduction, respectively, in the annual number of flights from 2007 to 2012. By comparison, Cincinnati/Northern Kentucky International Airport saw a 64.4 percent decline in flights and the Milwaukee General Mitchell Airport lost 37 percent of its regularly scheduled flights.

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TABLE J-4: CHANGES IN SERVICE AT SMALL MISSOURI AIRPORTS

CHANGES IN SERVICE AT SMALL MISSOURI AIRPORTS						
Airport	Enplaned in 2011	Departures in 2007	Departures in 2012	% Change in Flights 2007-2012	Airlines Serving in 2007	Airlines Serving in 2012
Columbia Regional	40,990	1,252	924	-26.2	1	1
Springfield Branson	349,091	11,730	8,061	-31.3	5	4
Cape Girardeau	5,940	320	1,253	291.6	2	1
Kirkville Municipal	5,100	1,248	1,095	-12.3	2	1
Joplin Municipal	27,379	1,430	730	-49	2	1

Source: MIT International Center for Air Transportation, 2013

Small hub airports lost an average of 18 percent of their scheduled flights, primarily due to a decrease in the number of flights to large hub airports and the elimination of flights to small and medium-sized communities (Table J-4). The remaining commercial service airports serving Missouri communities are either non-hub airports or airports receiving funding as Essential Air Service (EAS) airports. Non-hub airports experienced a 15.4 percent cutback in airline flights; airports covered under the EAS subsidies mandated by the federal government lost only five percent of their regularly scheduled flights.

Several factors will continue to influence the availability of commercial air service in small hub, non-hub, and EAS airports in the next few years:

- Expansion of ultra-regional carriers such as Cape Air, Great Lakes Airlines, Silver Airways, Frontier, and Allegiant
- Economic recovery in medium and small cities served by small hub and non-hub airports
- Proposed legislation that could negatively impact regional airlines
- The ongoing business models of major carriers geared toward profitability-based management versus other market expansion strategies

Communities that are geographically close to large or medium hub facilities are at the greatest risk of losing additional major carrier flights. However, expansion by the ultra-regional carriers, particularly to tourism destinations, may result in an increased number of flights to some locations. Discussions of the decline in the number of flights has primarily focused on impacts to passengers in terms of fewer flights and increased costs. But because a significant amount of air cargo flies in the belly of commercial passenger flights, the decline in passenger flights also impacts freight connectivity to major U.S. air hubs and international freight destinations.

In addition to the reduced number of scheduled flights, other trends are affecting small hub, non-hub, and EAS airports. Ultra-regional carriers are flying smaller, more fuel-efficient aircraft out of these airports. In the case of Cape Air, an American Airlines partner, nine-passenger Cessnas are the primary aircraft used to serve non-hub and EAS airports and they generally do not provide space for air cargo services (Figure J-7). Many of the ultra-regional carriers fly planes that do not provide flight

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attendants, on-board restrooms, or in-flight beverage service, but because the flights are of short duration (often 50 to 65 minutes), these amenities are not necessary.

With the moderation in fuel prices, the less fuel-efficient 50-seat regional jets may remain in service for several more years. Many airlines, however, have begun to replace these aircraft with more fuel-efficient 76-seat regional jets, which generally require a minimum of 70,000 passengers per year to operate efficiently compared to the 40,000 annual passengers required for the smaller 50-seat regional jets.¹⁷ The shift from 37-seat to 50-seat regional jets to larger 76-seat regional jets will further affect flight availability in small hub and non-hub airports.

Figure J-7: Cape Air's nine-passenger plane



Source: trainweb.org

The reduction in the number of flights from small hub and non-hub airports and increases in fares have made these airports less attractive to passengers. Local residents who previously chose the convenience and proximity of their local airport over the longer drive and higher parking costs of larger hub airports must now consider the smaller airports' increased airfares and longer layovers, versus driving a few hours to a larger airport. Communities with low population growth and low or moderate income growth may be unable to support their regional airports in the future. Regional airports within an hour or two-hour drive to a large or medium hub airport also face increasing pressure from passengers who can save money on fares and sometimes find inexpensive bus transportation to larger airports, thereby saving both fuel and parking costs.

Although the availability of flights and airfares has been significantly impacted by reductions in scheduled flights by major airline carriers, another potential issue for many communities served by medium hub, small hub, and non-hub airports is connectivity to markets for both freight and passenger service. Studies show that medium and small communities realize "significant economic benefits from well-connected commercial air service."¹⁸ Some of the smaller airports that lost service from major airline carriers were successful in attracting ultra-low-cost carriers such as Cape Air, Spirit Airlines, Great Lakes Air, and Silver Airways. These low-cost airlines typically service tourist destinations and offer limited connections to other strategic U.S. destinations. At some small hub or non-hub airports, the number of flights may not have decreased significantly but their connectivity to the national and international transportation network has been seriously affected.

Connectivity is determined by how well the airport is integrated into the larger transportation system: can passengers and freight move reasonably and efficiently throughout the network to reach desired destinations? The MIT International Center for Air Transportation recently developed a new Airport Connectivity Quality Index (ACQI) to allow airport managers, economic developers, businesses, and Department of Transportation to evaluate the quality of connectivity at various airports. Connectivity is based on the frequency of available scheduled flights, the quantity and quality of flight destinations, and the quantity and quality of connecting destinations. For example, flights into major large hub airports create a higher quality connection than an alternative flight into a small hub airport with fewer connecting opportunities.¹⁹

To test the quality of connectivity, the ACQI was used to compare changes at various airport types. **Tables J-5 and J-6** demonstrate the substantially higher decline in the connectivity index in medium, small hub, and non-hub airports than at larger hub airports.

The MIT study suggests that the decline in connectivity at small hub and non-hub airports is likely to continue as more airlines consolidate and carriers continue to eliminate redundant flights and reduce scheduled flights in smaller markets, noting that "only service that can prove itself to be profitable will remain a long-term part of the U.S. air transportation network."

The number of flights serving small hub and non-hub airports impacts the movement and cost of air freight from these airports as well. Major passenger airlines have increased their air cargo services in order to improve revenues, and all-cargo express services have expanded to provide specialized door-to-door services. Missouri businesses shipped \$1.2 billion in commodities by air freight in 2012.²⁰ The primary products shipped by air from Missouri—pharmaceuticals, basic chemicals, and electronic products—make up 83 percent of the total value of Missouri commodities shipped by air.

¹⁷ Wall Street Journal, "Leaner Airlines Mean Fewer Routes," May 13, 2013

¹⁸ Button, K. and S. Doh, "The Role of Small Airports in Economic Development," Journal of Airport Management, 2010

¹⁹ Wittman, Michael and William Swelbar, "Modeling Changes in Connectivity at U.S. Airports: A Small Community Perspective," MIT International Center for Air Transportation, June 2013

²⁰ Missouri Economic Research and Information Center, "Missouri Freight Transportation: The Economy on the Move Air Freight"

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TABLE J-5: REDUCTIONS IN SERVICE AT MISSOURI AIRPORTS

COMPARISON OF CHANGES AT VARIOUS AIRPORT TYPES

Airport Type	% change in ACQI 2007-2012	% change in # of seats 2007-2012	% change in domestic flights 2007-2012
Large hub	-3.9	-7.2	-8.8
Medium hub	-15.6	-21.4	-26.2
Small hub	-11.0	-14.3	-18.7
Non-hub and	-8.2	-9.9	-15.4

Source: MIT International Center for Air Transportation

TABLE J-6: COMPARISON OF CHANGES IN AIR CARGO AT MISSOURI AIRPORTS

COMPARISON OF CHANGES IN AIR CARGO AT MISSOURI AIRPORTS

Qualifying Cargo Airports	2013 landed weight in lbs.	2012 landed weight in lbs.	% change in landed weight
St. Louis	427,242,638	349,771,888	22.15
Kansas City	487,687,191	427,136,299	14.18
Springfield-Branson	208,638,520	202,800,100	2.88

Source: MIT International Center for Air Transportation

Small hub and non-hub airports best practices: passenger services

A number of strategies have been deployed at small and non-hub airports around the country to attract new carriers and increase available flights. Some of these strategies have produced varying degrees of success for a period of time, though most are not without risks. The most successful strategies with longer-term positive results were developed after a careful analysis of the area's unique passenger needs, market factors, and regional conditions, including local industry and institutional needs. Several of the primary strategies and specific community programs used to enhance airport operations are highlighted below.

Revenue guarantees

- Local communities and businesses guarantee a minimum amount of revenue to the airline for certain routes. If the route revenue is realized, no additional payment is required. If, however, the route revenue is below the revenue guarantee, the airport, community, and/or businesses are responsible for making up the gap.

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Reduction of use fees

- Most airports charge landing fees, airport rents, parking fees, or other fees and charges, which they may reduce or waive for certain airlines. Traditionally, these fee waivers are not conditioned on the service being successful, and they often cover a designated period of time that may continue even after a flight is discontinued.

Advertising and marketing assistance

- When airlines introduce a new or additional service in a market area, there are costs for advertising the new service to passengers. Many airports will provide airlines with grants to offset the cost of advertising and marketing new flights or services and help attract passengers.

Programs to identify strategic destinations and increase load factors

- Passenger surveys for both commercial and charter service destinations should be conducted annually to determine where passengers want to travel and clarify any seasonal factors that may impact flights to these destinations. Load factors represent the average number of seats filled with paying passengers on a nonstop flight. Flights that do not meet the average load factor may be considered poorly performing by the airlines. Efforts to improve the load factor are generally a positive for the airlines.

Travel banks

- Airports or area businesses purchase a block of pre-paid tickets for a specified travel period to support a new route or service. Similar to revenue guarantees, this incentive is designed to ensure a minimum number of passengers over a certain period for a new route or service.

Funding for airline incentives frequently comes from the airport authority, local community, and area businesses. Two federal grant programs can indirectly fund these incentives: the Essential Air Service (EAS) program and the Small Community Air Service Development grant program (SCASD). The SCASD program was created in 2002 and has a substantially smaller budget (\$14 million) than the EAS program (\$214 million). However, SCASD funds are available to non-EAS airports, making these funds more accessible.

These are challenging times for smaller airport facilities. New strategies and creative efforts are required to attract and retain the new carriers, flights, passengers, freight, and businesses that will help ensure aviation services are reasonably maintained and their contributions to the economic development of their regions remain intact. The strategies outlined below have succeeded in attracting critical services and increasing revenues in other communities.

Manhattan Regional Airport, Kansas

This non-hub airport covered under the EAS program receives funds to provide subsidized service to Kansas City International Airport. In 2009 the airport began offering service from American Airlines to Dallas/Fort Worth International Airport using a two-year revenue guarantee. The airport applied for a \$300,000 SCASD grant to undertake a comprehensive marketing campaign and air service development program. As part of this effort, the airport pledged \$500,000 in free parking to encourage passengers to patronize the Manhattan airport rather than driving to the Kansas City International Airport. The airport developed a multimedia marketing effort and began an airport rewards program for passengers who fly out of the Manhattan airport. The airport evaluated its current passenger enplanements and identified a number of Kansas State University employees who chose to fly out of the local airport. Additional marketing strategies were developed to focus on that customer base.

The advertising program, free parking, and passenger rewards program was ultimately successful, as American Airlines continues to provide three flights per day to DFW even after the expiration of the revenue guarantees. American has also added flights to its Chicago service from this airport. A strategy built on knowledge of their passenger base, effective regional advertising, and strategic passenger rewards has resulted in an increased number of flights from this airport—from 1,389 flights in 2010 to 1,763 flights in 2012.

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Trenton-Mercer Airport, New Jersey

In 2013 this small airport grew at a faster rate than any other domestic air operation in the U.S.²¹ Commercial passenger service was non-existent in 2011, but in 2012 Frontier Airlines located at the airport. In 2013 Frontier flew 117,680 passengers, providing a niche service for the significant population living east and north of Philadelphia and south of the Newark area. Frontier offers lower fares than the larger carriers, and flies on certain days to cities including Nashville, St. Louis, Chicago, Atlanta, Minneapolis, and Orlando. The Trenton airport discovered that a significant number of passengers are willing to fly at off-peak times to secure lower fares.

Columbia Regional Airport, Missouri

Prior to 2012 the Columbia airport was served primarily by US Airways, which provided Beechcraft services to Kansas City and St. Louis. In 2012, Columbia retained a consulting firm to develop an aggressive strategy for attracting additional aviation services to the airport in future years. The airport developed a menu of incentives, including waived landing fees, revenue guarantees, and radio advertising. As a result of this comprehensive approach, Columbia was successful in attracting American Airlines, Frontier Airlines, and Delta Air service, providing flights to a hub for each of these airlines. The additional airlines increased one-stop service destinations from 84 destinations in 2011 to 230 destinations in 2012.

Columbia has been successful in using incentives to attract or retain additional airline services. There are real risks associated with these strategies, however, as evidenced by Frontier Airlines' decision in May 2013 to discontinue flights from Columbia to Orlando after six months of service. The frequency of flights and number of destinations out of the Columbia Regional Airport has improved since this approach was initiated, however, and overall the incentives have been successful.

Cape Girardeau Airport, Missouri

In 2008, the Cape Girardeau airport was designated an EAS airport with 443 enplanements. By 2010 enplanements had increased to 4,862, and in 2014 Cape Air offered four daily flights to St. Louis and four return flights to Cape Girardeau. Cape Air is an American Airlines partner offering service aboard nine-passenger Cessna 402 airplanes in smaller communities. As a result of community partnerships, passenger traffic increased 29 percent from 2010 to 2012, and advance bookings are up 12 percent in 2014 compared to 2013. Cape Air is a low-fare carrier, and the community has secured a \$1.6 million EAS contract to offset commercial airfare costs, offering passengers from this region access to Lambert-St. Louis International Airport.

Huntsville International Airport, Alabama

More than 70 percent of passengers flying from the Huntsville International Airport are flying for business. Huntsville has been recognized by Forbes magazine as one of the Best Cities for Technology Business and it has an outstanding quality of life; however, the city lost 18 percent of its airline flights over the past five years as more and more passengers drive the 95 miles to Birmingham International Airport or 123 miles to Nashville International Airport.

The City and County, long recognized for their outstanding regional partnership, worked together to develop new strategies that would enhance the local passenger experience, reward the airlines that were supporting the region, and lower incentives for airlines that were reducing flights and connectivity at the Huntsville Airport. In addition to the decline in the number of flights, Huntsville businesses reported a steep increase in fares; the U.S. DOT has cited Huntsville as having among the top 100 highest domestic air fares. In 2010, the Huntsville region secured a \$1 million federal grant and contributed \$1.5 million in local funds to attract AirTran, a low-fare carrier, to the community. The airport waived landing fees, offered lower rents, and provided marketing support, and a number of regional businesses committed to purchase a minimum number of tickets over a two-year period. But when Southwest purchased AirTran in 2012, the AirTran flights into Huntsville were discontinued. Additional community-supported strategies, including a customer standards program and revamped landing fees, were initiated. This resulted in the trade group Airlines for America threatening to file a lawsuit against the airport for failing to treat all airlines equally. In the end, Huntsville eliminated the customer standards program and for the time being American Airlines has instituted discounted fares to some destinations. The airport has received additional funds from the city and county to recruit another low-fare carrier.

Bozeman Gallatin Field Airport, Montana

This airport serves as a gateway to Yellowstone National Park. In 2011, the airport requested a \$1 million grant from SCASD to attract a new direct flight to the New York City metro area. Bozeman committed to provide \$725,000 in local revenues to match the federal grant. These funds were raised from local and state tourism organizations, a public-private tourism partnership, and regional resorts and tourism destinations. The funds were committed to entice United Airlines to provide

²¹ Times of Trenton, "Trenton-Mercer Airport finds success in niche market," April 3, 2014

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nonstop service for a two-year period from Newark Liberty International Airport to the Bozeman airport. After the initial trial period, air service was expanded from 13 to 20 flights per season. The commitment of local revenues and aggressive marketing efforts to secure community buy-in helped to enhance passenger traffic, and the service continues to operate successfully in season.

St. Cloud Regional Airport, Minnesota

This college town with a population of just over 60,000 is a 95-minute drive from the Minneapolis International Airport. Prior to the merger of Northwest Airlines with Delta, Northwest offered five flights a day from St. Cloud to the Minneapolis airport. After the merger, commercial air service was eliminated. The airport and the City of St. Cloud worked together to prepare a passenger-demand analysis study and developed a strategy to build relationships with airlines. As a result of these efforts the City identified a need for flights to Chicago-O'Hare Airport, and an aggressive strategy was developed to pursue a carrier to provide this service. A \$750,000 grant application was submitted to SCASD to support a revenue guarantee for the carrier that provides the service to Chicago.

The St. Cloud Development Corporation and the City of St. Cloud created a travel bank, securing pledges from area businesses to fly out of St. Cloud if air service to Chicago were provided. To date the travel bank has received \$6 million in pledges, exceeding their initial target. This collaboration shows a strong local commitment for the Chicago connection. The airport has also remodeled its terminal building, expanding gate areas and passenger facilities. The partnerships created to pursue the Chicago service have continued, and the airport has attracted Allegiant Airlines, which offers two flights weekly to Phoenix.

McAllister Field, Yakima, Washington

In 2010, Yakima experienced a decline in daily air service to Seattle. The City of Yakima was determined to get the flights reinstated and win additional service to Portland, Oregon. The community initiated a marketing campaign to promote the advantages of flying out of Yakima Air Terminal, with a goal of increasing loads on three existing flights to Seattle. Yakima chose to focus its efforts on Alaska Airlines. The City funded a marketing study, and their discussions with Horizon Air, an Alaska Airlines partner, were very specific about the impact of low flight loads. The City, with Alaska Airlines' help, learned how communities in Oregon had boosted flight loads to 75 percent. As a result, the City of Yakima has invested \$70,000 in a "FLY YKM" campaign using websites, television, radio, and local newspapers to raise passenger awareness of flight options from the Yakima airport.

Alaska Airlines has partnered with the City in this effort, demonstrating a commitment to build the viability of air travel out of Yakima. As a result of these efforts, flight loads had increased to the 75 percent mark, making the addition of new flights more likely in the future. The City and the airport have committed to conducting additional marketing surveys to determine where travelers want to fly.

Colorado Springs Airport, Colorado

This airport serves a regional population of 610,000 and is located 97 miles south of Denver International Airport. The airport currently has four carriers (Delta, United, American, and Allegiant) with non-stop flights into eight cities. Colorado Springs Airport continues to attract and retain regional businesses. The Colorado Springs Airport Business Park, with 1,000 acres adjacent to the airport property, has attracted a number of aviation-related businesses. The park offers businesses a number of incentives and amenities including a foreign trade zone, personal property tax credit, sales tax exemption, and access to workforce training services.

Frontier Airlines located a 100,000-square-foot maintenance facility at the airport, and the City of Colorado Springs provided a tax-exempt special facility bond for its construction. Ultimately Frontier announced low-fare service from Colorado Springs to their Denver hub, linking the airport to low-cost air service connections around the U.S. and to Mexico and Canada.

Mid-size and small hub airport best practices: air cargo

Air cargo operations have a very different business model from passenger airlines. Air cargo is used primarily to ship high-value, lightweight, and time-sensitive goods. Air cargo operators, outside of integrators like FedEx and UPS, work primarily with freight forwarders or cargo consolidators to ensure shipment volumes to various destinations. While air cargo can easily land at non-commercial service airports, few independent air-cargo-only airports have been successful in accomplishing this, with the exception of several former military air force bases that have been redeveloped and include an air cargo airport as part of their site development strategy. The former George Air Force Base in California is now the Global Access Southern California Logistic Center with a logistics airport. The Port of San Antonio, formerly Kelly Air Force Base, has a 1,900-acre industrial park for aerospace, logistics, manufacturing, and military contractors and eight million square feet of leased facilities adjacent to a cargo

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and logistics airport. Rickenbacker Global Logistics Park, developed at the Lockbourne Army Air Base in Ohio, has a cargo-dedicated airport that is part of the logistics park redevelopment. The total air cargo traffic for the top cargo airports is indicated in **Table J-7**.

A number of common factors have influenced the growth of air cargo operations at certain U.S. airports:

- Presence of a major integrator facility, such as the Fed Ex hubs in Memphis and Indianapolis or the UPS hub in Louisville
- Commercial real estate assets near a strategic airport to support the development of warehousing, support services, industrial parks, and outstanding highway infrastructure connecting these assets to the airport
- Gateway airports dominate the air cargo markets for imports and exports; they include JFK International Airport and Miami International Airport in the east and LA International Airport in the west
- Benefits from multiple carriers at larger airports provide access to a diverse network from which to consolidate air cargo from feeder airports
- Changes in customer shopping are causing the global marketplace to be more connected, and demand for order fulfillment is driving the demand for airport-centric industrial space and air cargo facilities

Memphis International Airport, Tennessee

Memphis is the world's second busiest air cargo hub and a leading U.S. distribution and logistics center. Although passenger flights have declined at the Memphis International Airport, air cargo volumes increased three percent in 2013 over 2012, supporting over 220,000 jobs in the local economy—95 percent of which are related to the air cargo operations.²² As a result of the air cargo capabilities at the Memphis airport, a number of electronics, medical research, and medical device companies have located facilities nearby. These include Samsung Electronics; Medtronic, a spinal instruments company with distribution and warehousing; a surgical tool advanced manufacturing facility in Memphis employing over 1,500 people; Oxford Immunotec, a medical diagnostics firm that moved from Boston to Memphis; and the National Eye Bank Center, which stores corneas for ocular surgery. The FedEx cargo hub at this airport has played a significant role in the growth of air cargo and in attracting businesses to the region. But the airport's connections to Interstate highways, Class 1 railroads, major trucking firms, and the Port of Memphis has made the city a prime location for warehousing, distribution, and overnight shipping capabilities, and these continue to attract high technology businesses to the region.

Louisville International Airport, Kentucky

United Parcel Service opened a logistics hub at the Louisville Airport in 1980 and changed the face of the Louisville economy. This location became the UPS worldwide air hub in 2002. A number of industries have since located in the area to take advantage of its distribution network, including Amazon, Zappos, Geek Squad, Toshiba (which contracts with UPS to repair their laptops), and Eurofins, a biotechnology company that performs tissue sequencing and chose to locate near the UPS facility so they could quickly obtain tissue samples, sequence them, and return data to hospitals around the country. Regional economic developers acknowledge that the UPS WorldPort has had a lasting impact on the region's economy, attracting 140 employers and 10,000 jobs to the area. Louisville has mastered the art of providing value-added services connected to the airport. The Nikon distribution center for the Americas is located near the Louisville Airport; workers there add accessories such as batteries, chargers, and promotional materials to camera kits before they are shipped to retailers. Reebok, the principal supplier of jerseys for National Football League teams, has a distribution center near the airport where they send blank shirts, which are finished once the demand for specific teams is known.

Miami International Airport, Florida

The Miami International Airport handles 77.4 percent of the fruit and vegetable imports, 91.4 percent of flower imports, and 55.2 percent of fish imports coming into the United States. Perishable products, high-tech commodities, telecommunications equipment, pharmaceuticals, and industrial machinery make up 80 percent of the products moving into and from this airport. The air cargo terminal has been expanded to provide 4.4 million square feet of cargo aircraft parking and 3.4 million square feet of warehousing, office, and support services. The Miami Airport developed a Cargo Clearance Center to provide one-stop services under one roof for U.S. Customs and Border Protection, Food and Drug Administration, Fish and Wildlife Service, and trade documentation processing. Miami is the eleventh busiest cargo airport in the world based on total cargo tons, serving primarily South American, Latin American, and Caribbean markets.

²²Dr. Yossi Sheffi, "Logistics Hubs: Long Term Value," MIT Center for Transportation and Logistics, January 2013

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Indianapolis International Airport, Indiana

Indianapolis is the second largest FedEx hub in the world and the world's 22nd busiest cargo airport. The airport invested over a billion dollars in terminal and freight facilities improvements in 2008. Seventy-five percent of the U.S. and Canadian populations can be reached by truck within a one-day's drive from Indianapolis. The City is served by four major Interstate highways, two Class I railroads, and port facilities on the Great Lakes and the Ohio River.

Port of Huntsville, Alabama

A city of 187,000 people, Huntsville is home to a major cluster of high technology businesses as well as NASA's Marshall Space Flight Center and the U.S. Army's Redstone Arsenal. While passenger air travel in the Huntsville region has experienced challenges, air freight and intermodal services are thriving. Huntsville and Madison County have a history of working collaboratively to achieve regional goals. The region developed the Port of Huntsville, a multimodal transportation facility integrating freight services for air cargo, rail, and highway. The Port of Huntsville is one of the few notable success stories in attracting a major freight forwarder, which is essential in building a successful air cargo operation.

Ten daily B747 freight flights depart from Huntsville on Atlas Air on behalf of global freight forwarders Panalpina and Cargolux. Panalpina, a European freight company, has a presence at the port of Huntsville along with FedEx, BAX/Schenker, Cargolux, Atlas Air, and UPS. Today this airport ranks 14th in the U.S. in international cargo movements, falling between Philadelphia International Airport and Seattle-Tacoma International Airport in total volume of freight per year.

NASA just announced construction of a new 110,000-square-foot facility at the port, and Boeing Alabama has decided to locate its research center inside the port complex, which is situated on 7,000 acres adjacent to the Huntsville International Airport. The port is extending both runways to accommodate Boeing 747-8 aircraft, which will provide non-stop cargo flights to Asia, Europe, and Latin America. The only airport with a longer runway is Miami International. The port's Jetplex Industrial Park is a 4,000-acre park with direct runway access to industrial sites and an international intermodal center that offers specialized cargo handling, storage, distribution, receiving, customer services, and a Foreign Trade Zone.

A variety of factors support the growth of air cargo operations at gateway airports and integrator (FedEx and UPS) hubs. These include:

- Perishable commodities and biologics drive the case for higher cost air freight; examples are food, flowers, and fish imported through Miami, and medical diagnostics and medical devices exported domestically and internationally through Memphis
- Available land for industrial development and warehouse and distribution space
- Multiple airline carriers can consolidate loads to serve destinations for a number of freight forwarders
- Adequate runway length to accommodate large freight aircraft as well as major airlines' passenger jets
- Presence of air freight forwarders or cargo consolidators to consolidate shipments for specific destinations
- Ground and air cargo handling equipment and trained personnel to load and offload large freight aircraft and provide additional customer services including cold storage facilities, warehousing, receiving, and customer service
- All-weather navigation systems
- Excellent highway connections and accessibility to surface transportation providers with national and international connections

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Table J-7: AIRPORT COUNCIL INTERNATIONAL TOTAL AIR CARGO TRAFFIC

AIRPORT COUNCIL INTERNATIONAL TOTAL AIR CARGO TRAFFIC, 2013

Top 30 worldwide rank	US city/airport	Total cargo, in metric tons	% change over 2012
2	Memphis	4,137,811	3.0
6	Anchorage	2,421,145	-1.7
7	Louisville	2,216,679	2.2
11	Miami	1,945,012	0.8
14	Los Angeles	1,747,284	-1.9
19	New York	1,295,473	0.8
21	Chicago	1,228,791	-2.0
22	Indianapolis	991,953	6.4

As global markets continue to grow and customer expectations increase, air cargo is likely to increase as well. A recent report states that “the top twenty freight forwarders essentially control over 80 percent of world air cargo,” creating a significant challenge for airports that do not have one of these major freight operators.²³ One exception is the success at the Port of Huntsville, where two global freight forwarders fly regularly scheduled B747 freight flights weekly, and current airport expansion will enable freight forwarders to fly B747-8 freight aircraft. Efforts to recruit major freight forwarders to other small hub airports have met with very limited long-term success. Strategies to enhance air cargo operations at smaller airports that have produced initial improvements include:

- Targeting small air freight forwarders specializing in products that need to move on special-purpose freight aircraft
- Concentrating on specific products and industries and demonstrating core competencies in these products and sectors; pharmaceuticals and life science products, for example, require assurances that the final delivered products have been handled to ensure their integrity
- Focusing on perishable products including vegetables, fruits, and medical diagnostics, which require speed to market, can offer unique opportunities for air cargo feeder facilities
- Charlotte International Airport has focused on attracting manufacturing and logistics providers to a large industrial park located near the airport to boost air cargo demand

To successfully recruit air cargo operations, airports must analyze their region's industrial and institutional need for air cargo services, the infrastructure required to meet those needs at the airport, and the transportation infrastructure accessing the airport. The market will be the driving force in attracting air cargo operators. However, other factors such as warehousing, ramp space, navigational systems, cargo handling equipment and personnel will also influence businesses' location decisions. Finally, retaining existing passenger air services is very important to expanding air cargo from small hub airports, as almost 40 percent of air cargo still moves in the belly of passenger aircraft.

Summary of best practices

Small hub and non-hub airports must think outside the box to attract additional passenger flights, retain existing air service, connect to destinations that are important to their regions, and provide air cargo services. Low-cost carriers have provided important airline service connections in smaller markets, taking up the slack when Southwest Airlines and other major carriers changed their business models and reduced or eliminated flights out of a number of small hub airports; but many of these carriers do not transport air cargo. Airports and municipal governments have succeeded in developing partnerships and engaging the regional business community in new ways to assist in efforts to attract and retain air services important to their

²³ Ghosh, D.J., “Market and Operating Dedicated Air Cargo Airports”

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region's economy.²⁴ Many of the strategies that appear to have generated longer-term success utilized some form of revenue guarantees and local marketing initiatives to educate regional travelers about the advantages of flying out of their local airport rather than driving to a major air hub.

Many of the strategies outlined in the previous section have associated risks, and these should be carefully evaluated before funding is committed. Because of the limited funds available through the SCASD program, applications that include local funds receive higher marks. As a result, local as well as federal funds are at risk.

There are viable options for enhancing air service at Missouri's small hub and non-hub airports and EAS facilities, particularly those that build on linkages between low-cost carriers and the tourist destinations in the southern part of the State. Several small hub airports outside the state have successfully engaged regional tourism facilities, which have contributed funds and in-kind services to attract low-cost air carriers. Local communities and airports have conducted surveys to identify destinations to which area businesses frequently travel, and destinations where regional companies ship high-value products by air freight, in order to document destinations important to local businesses and provide this data to low-cost carriers and air cargo consolidators.

Aviation and economic development

Airports help facilitate the movement of people and goods to domestic and international destinations and the global marketplace. They connect businesses to larger markets and new customers, facilitate the sourcing of better and cheaper raw materials, and connect people to travel and tourism opportunities. A number of studies have documented the importance of airports to regional economic development and economic growth. Because major airlines have changed their business models, many small hub and non-hub airports now have fewer commercial flights, and they struggle to compete with larger hub airports located within a two-hour drive. In light of these changes in commercial airline services at small hub and non-hub airports, communities must be aggressive and creative in promoting the economic benefits of aviation to their region.

The size of the airport and the number of flights, destinations served, number of passengers enplaned, and volume of freight defines the scale of airport operations for evaluating the important role airports play in economic development. Major airports are powerful economic drivers, and the business clusters near these facilities continue to expand—reflecting the desire for enhanced connectivity to domestic and global markets. The aerotropolis concept promoted by John Kasarda envisions airport cities where passengers and area residents can shop, do business, share ideas, and be entertained within the airport catchment area, which forms a new central business district of sorts. A number of cities including Detroit, St. Louis, Memphis, Atlanta, Denver, and Indianapolis have considered the concept, although there are no clear measures of performance and no successful outcomes in the U.S. as yet. Other cities have located major business parks near their airports to take advantage of the available multimodal transportation connections.

Only two percent of the total cargo volume in the U.S. moves by air, but that cargo represents 35 percent of the value of all commodities. A recent study by Richard Florida found that the availability of an airport does influence exporter businesses and affect their business location decisions, but in many cases the ability to move people efficiently may be more important than moving goods.²⁵ A subsequent study found the importance of air transportation is not uniform for all industry sectors; service and government sectors benefit more from access to aviation than other industries.²⁶ This study found that many service and high-value economic sectors are more likely to concentrate near large hub airports because air transportation adds greater value to their operation. The sectors that tend to benefit most from access to large hub airports include:

- Management of Companies and Enterprises (NAICS 55 sectors)
- Professional, Scientific, and Technical Services (NAICS 54 sectors)
- Wholesale Trade (NAICS 42 sectors)
- Information (NAICS 51 sectors)

A review of industry sectors with the highest percentage of employment in Springfield-Greene County, Missouri found that manufacturing, retail trade, administrative and waste services, transportation and warehousing, and accommodation and food services were the largest employers in the area.

This does not mean airports will not be a valuable tool for economic development in small hub or non-hub airport communities. A number of small hub and non-hub communities have found strategies for building their economies that integrate their airport

²⁴ Federal Aviation Administration and the Transportation Research Board, ACRP Report 18, "Passenger Air Service Development Techniques"

²⁵ Florida, Richard, Charlotta Mellander, and Thomas Holgersson, "Up in the Air: The Role of Airports for Economic Development," October 2012

²⁶ Stilwell, Justin and John Hansman, "The Importance of Air Transportation to the U.S. Economy: Analysis of Industry Use and Proximity to Airports," MIT International Center for Air Transportation, May 2013

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with other modes of transportation to be increasingly important. Memphis, Louisville, and Huntsville are example of airports that have faced challenges in their passenger services and at the same time have expanded their air cargo facilities, creating jobs and improving operations for existing businesses in the region. The City of Troutdale, Oregon is redeveloping a brownfield site located adjacent to its regional airport and I-84 to build the Troutdale Reynolds Industrial Park. The goal is to attract manufacturing companies involved in international business. The site is in a designated economically distressed area, and the new jobs will enhance the sustainability and quality of life for the surrounding communities.

Economic development benefits associated with airports are not limited to passenger services and freight movement. Research indicates that increased demand for air services, for both passengers and air cargo, will result in increased production in the aerospace sector for the next ten years. Kansas City and St. Louis have competed recently for Boeing facilities, and St. Louis recently succeeded in attracting a Boeing project that will offset employment losses anticipated at the Boeing defense aviation facility. Missouri's existing aerospace manufacturing industry and skilled workforce, coupled with the extensive research and development expertise in its universities and private research facilities, creates an attractive environment for further aerospace investments.

In addition to Missouri's diversity of aviation manufacturing facilities, a number of its colleges and universities have established highly-regarded aviation and engineering programs and testing facilities. Research centers at Missouri University of Science and Technology include the Center for Aerospace Manufacturing Technology, the Center of Excellence for Aerospace Particulate Emission Reduction, the Materials Research Center, and the GE Aviation Development Center. Other university aerospace facilities include the MSU Center for Applied Science and Engineering, the Washington University Center for Materials Innovation, and the Aerospace Research and Education Center, a consortium of Washington University, St. Louis University, the University of Missouri, and Missouri University of Science and Technology.

Given the number of existing aerospace companies in the state, the research and development ventures that support aerospace and aviation, the skilled workforce currently sustaining aerospace businesses, and the recent expansion of Boeing's facility in St. Louis, communities in Missouri can continue to attract aerospace and aviation companies, particularly if the all-important multimodal transportation infrastructure is available.

Missouri Department of Economic Development has identified advanced manufacturing as one of the State's targeted industry sectors. Missouri has chosen to focus on two primary clusters within the advanced manufacturing sector: aerospace and defense and transportation equipment manufacturing. The importance of multimodal freight transportation to the aerospace and defense industry is clearly evident in the site selection criteria used by Boeing Aerospace for their 7E7 project, and in the recent Airbus site evaluation process. Both are shown on the following page (**Tables J-8 and J-9**). Boeing located its 7E7 production facility in North Charleston, South Carolina. Airbus selected a site in Mobile, Alabama for manufacturing the Airbus A319, A320, and A321. Understanding the site selection criteria for these two projects can provide valuable insights into the factors aviation suppliers and component producers may consider in future location decisions. Transportation and freight were key considerations in the site evaluation process for these two projects.

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Table J-8: Boeing 787 Dreamliner Site Selection Criteria

BOEING 787 DREAMLINER SITE SELECTION CRITERIA

1. Transportation requirements:

- Suitable airport runway provision
- Proximity to a port capable of providing 24-hour shipping operations
- Continuous availability of heavy traffic ways between plant site and the port
- Proximity to railways and Interstate highways - the availability of dual rail infrastructure was considered crucial to an expansion at the port of Charleston

2. Additional infrastructure issues:

- Relative cargo and freight costs
- Availability of utilities at the site including water, sewer, electric, waste, and telecommunications
- Transportation enhancements that support schedule and production requirements - South Carolina funded and managed transportation infrastructure improvements

3. Facilities requirements:

- Site located at former joint use facility for Charleston Air Force Base and Charleston International Airport. New intermodal facility located on portion of Charleston Naval Yard. Available land and related infrastructure to accommodate 787 final assembly and the co-location of suppliers.

4. Life-cycle and start-up costs requirements:

- Boeing conducted detailed financial analysis of all costs

5. Workforce requirements and community support

6. Site environmental considerations

Source: Boeing Corporation web site

Table J-9: Airbus 319, A320, AND A321 PRODUCTION FACILITY SITE criteria

AIRBUS 319, A320, AND A321 PRODUCTION FACILITY SITE CRITERIA

1. Transportation requirements:

- Access for suppliers via air, rail, highway, and water to optimize transportation cost, cycle time, and risk across the supply chain. Transportation cost considerations have increased in importance. Delivery times for key components and assemblies are crucial and close collaboration with all suppliers is critical
- Access to open airspace airport for testing of aircraft components and assemblies
- Rail access to the site
- Close proximity to major interstate highways
- Access to a deep water port, as parts produced in the U.S. will be exported to locations in Europe

2. Additional infrastructure issues:

- Relative cargo and freight costs
- Availability of utilities including standard water and wastewater treatment and distribution to meet specific process requirements, reliable electric service with redundancy, natural gas, high speed fiber communications with engineering, production and delivery sequencing

3. Facilities requirements:

- Selected Brookley Aeroplex - Airbus required a minimum 200-acre site for a manufacturing space of 1 million square feet
- Security was a critical issue

4. Life-cycle and start-up costs requirements:

- Airbus conducted detailed financial analysis of all costs

5. Workforce requirements and community support

6. Site environmental considerations

Source: Airbus Annual Report 2012, Foreign Direct Investment Analysis, NGK

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Conclusion

Aviation will continue to be important to Missouri communities, and major air carriers and air freight forwarders will change their business models to respond to the evolving needs of their customers. This may create air service challenges for many small hub and non-hub airports. For some service-producing industries, proximity to large hub airports will be an important site location factor. But for many service and advanced manufacturing businesses, reasonable access to airports may enhance their interest in small hub and non-hub airport communities. Communities without major hub airports can expand their air cargo operations, develop business parks adjacent to airport facilities, and identify other strategies that will make their airport facility more valuable to the regional economy and promote future economic development.

Port Investment in Container-on-Vessel Service

With the expansion of the Panama Canal nearly completed, there is little debate that Gulf and East Coast ports will see increases in foreign trade in the form of containerized cargo. There is, however, much speculation as to which ports of call will experience the greatest growth. U.S. trade is projected to increase by 45 percent between 2008 and 2030,²⁷ and it is anticipated that all ports of call will experience an increase in trade activity. Assuming these trade projections are accurate, this paper also presumes that container-on-vessel (COV) service is technically feasible, economically attractive, and environmentally advantageous for the Mississippi River system.

With these assumptions, this white paper highlights the possibilities of COV for Missouri; discusses which current and expected commodities may utilize the inland waterways system, and how these commodities align with current Missouri exports; explores the challenges and opportunities for Missouri to capitalize on the expected increase in COV use on the Mississippi River system; and outlines what COV means to Missouri's businesses and economic development.

History of container-on-vessel service on the Mississippi River

Since the inception of containerized cargo in the 1950s, the container shipping industry has continued to evolve toward greater efficiency. Greater efficiency means moving more loaded boxes per voyage, which in turn creates incentives to build even larger vessels. Mississippi River COV transport began in March 1994 when America's Marine Express began an all-water service between Memphis, Tennessee and Mexico, Guatemala, Honduras, and El Salvador via the Mississippi River.²⁸ The service utilized a chartered river-ocean vessel, offering Midwest shippers a direct alternative between Memphis, Mexico, and Central America with a 14-day round trip voyage. The service lasted only a few months, however. It was discontinued in August 1994 as aggressive pricing from rail and truck competitors resulted in slower than anticipated acceptance.²⁹ Although volumes were increasing with each voyage, operating losses and negative prospects for future profitability did not warrant continuation of the service.

In 2000 the Osprey Line began offering container barge service from Houston to New Orleans and from New Orleans to Memphis. The line has focused on heavy and out-of-gauge cargoes to maximize value. The Memphis-New Orleans service relied on containerized cotton, lumber, and glucose, all southbound for export on containerships.³⁰ Transit time was five days by barge, compared to six hours by truck. After Hurricane Katrina, Osprey lost significant New Orleans business, and the Memphis service was ultimately discontinued in 2009 due to a lack of northbound cargo. It appears service has restarted, however; the company's website lists a regular weekly service from Houston to New Orleans, with an "inducement based service" for other port pairings including the St. Louis region.³¹ Osprey Lines, based in Memphis, Tennessee, is the only COB service currently operating on the Mississippi River.

According to Rick Couch, the operator of Osprey Line at the time service was discontinued, "Another hindrance to the success of the service was the port and dockage fees imposed on the water carrier with no similar charge to the truck lines. Ports should either waive dockage and port charges for inland waterway container transport (IWCT) or charge trucks or rail to come and go in and out of the port. Although not a deal breaker, these charges make IWCT less competitive with other modes."³²

²⁷ Federal Highway Administration, Office of Freight Management and Operations, Freight Facts and Figures 2013, January 2014

²⁸ Stan L. Swigart, James. R. Amdal, and Tara Tolford, New Orleans Metropolitan Inland Waterway Container Transport Feasibility Study Final Report, September 2011.

²⁹ Ibid., 2011

³⁰ Ibid., 2011

³¹ www.ospreyline.com

³² Swigart, Amdal, and Tolford, 2011

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Other current examples of inland waterway operations include the 64 Express between Norfolk and Richmond, Virginia using the James River, which has been operating since 2008, and Tidewater on the Columbia River in Oregon which has been in operation since 1932.³³

What is required for COV transport on inland waterways?

Barge tow, which consists of a tow boat pushing barges, is currently used on the Mississippi River. A standard Mississippi River barge is 195 feet long and 35 feet wide, with a draft up to nine feet and deadweight (cargo) capacity of 1,500 tons. Larger barges may be up to 290 feet by 50 feet, with deadweight capacities of 3,000 tons. Towboats range in size from about 117 feet long by 30 feet wide to more than 200 feet long and 45 feet wide. An average tow on the Mississippi waterway is around 15 barges, but can go up to 40 barges depending on the type of cargo, the river segments being navigated, and the size of the towboat.

COV could utilize existing jumbo barges, each holding 72 twenty-foot equivalent unit (TEU) containers stacked six containers long, four containers wide, and three containers high.³⁴ A TEU is the standard measure for containers, used to count containers of various lengths. A standard 40-foot container is two TEUs, and a 48-foot container equals 2.4 TEUs. This measurement is used to describe the capacities of container ships or ports, according to the Bureau of Transportation Statistics.

Figure J-8: Container-on-Vessel Transport



Source: www.marad.dot.gov - 2005 Osprey Line

At present barge tow is typical on the Mississippi River (Figure J-8), although self-propelled barges as shown in Figure J-9 may become more common. The self-propelled vessel would be more fuel-efficient and faster than the standard tug-barge combination operating on the inland waterways. The same hull design could be used for both Roll-on/Roll-off (Ro/Ro) and container service vessels, contributing to efficiencies of scale.

³³ Ibid, 2011

³⁴ Port of Pittsburgh Commission, Container-on-Barge Pre-Feasibility Study Final Report, July 2003

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Figure J-9: Self-Propelled Vessel



Source: www.shipwrecklog.com

The inland waterway infrastructure includes several elements in addition to the transport vehicle. The list below is not exhaustive, but it generally represents the facilities included in navigation, port, and landside infrastructure.

- Channels
- Locks and dams
- Channel training structures
- Dredged material placement facilities
- Tow marshalling areas
- Berthing facilities (docks, dredged berths, and anchorage areas)
- Aids to navigation (channel buoys, global GPS, automatic identification systems, and updated charts)

Port capacity depends upon:

- Channel depths
- Channel widths
- Turning basin size
- Sufficient bridge heights
- Port support structures such as dock and crane capacity to offload and load goods

To be cost efficient, a terminal requires sufficient space to store the containers, a 20- or 30-ton overhead crane or a mobile crane, spreader bars for 20- and 40-foot containers, a 20- to 30-ton container forklift, and ground strength sufficient to support the concentrated wheel points of the forklift carrying a loaded container.³⁵ The M-55 Marine Highway Corridor Study, which was sponsored by the Heart of Illinois Regional Port District and Missouri Department of Transportation in order to develop marine intermodal transportation services on the Mississippi and Illinois Rivers, identified slightly different requirements for COV:³⁶

- **Ground storage:** A terminal is typically required to provide 2.5 times the ground storage needed to work a vessel.
- **Grain storage and bulk-container loading:** The terminal will need silos sufficient to store 20,000 metric tons of grain and must be able to load up to 400 containers a week. Belt throwers (Figure J-10) used to load bulk containers are typically able to fill six containers per hour, so five to six bulk container loading stations will be required.
- **Yard equipment:** Existing river ports are required to have 25 ton or larger cranes and storage capacity for 180 containers in order to initiate service. Reach stackers and terminal tractors and trailers are highly effective in small to medium-sized terminals due to their productivity, flexibility, and relatively low capital cost. Container forklifts are more efficient for moving the containers within the port terminal.

³⁵ Southeast Ohio Port Authority, Container-on-Barge Port Concept Paper, June 2008

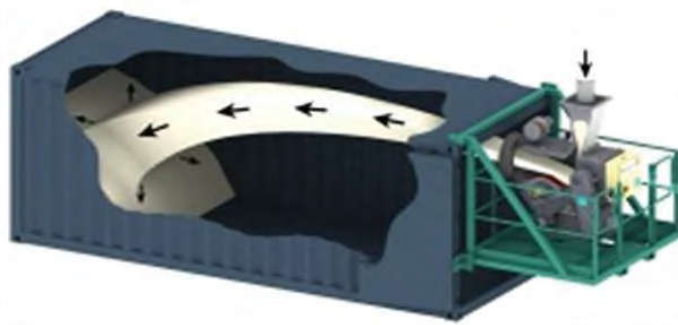
³⁶ RNO Group, M-55 Illinois-Gulf Marine Highway Initiative Final Report (TRyy 1130), March 2013

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- **Berth length:** 1,100 feet must be allowed to accommodate two Stage 2 container or Ro/Ro self-propelled barge vessels.

Also required are a gate facility for receiving and delivering 1,150 containers per week, an administration building, and maintenance and repair facilities for container yard equipment.

Figure J-10: Belt Thrower Loading Bulk Commodities



Source: RNO Group, 2013

Which primary commodities currently utilize COV, and which are projected to utilize it in the future?

The main role of inland waterways in the export market has been in the global trade of grains and coal. The system typically handles more than a billion tons per year. The cargoes are mostly bulk commodities and raw materials such as coal (which makes up 28 percent of total tonnage), petroleum (37 percent), grain and farm products (10 percent), chemicals (5 percent), aggregates, steel, and fertilizer.³⁷

Existing U.S. barge transportation handles commodities such as dry bulk (gravel, coal and agricultural products); liquid bulk in the form of tankers; large and semi-manufactured items; trucks, trailers, machines with Ro/Ro capabilities; and containers.³⁸ Dry bulk shipping represents the majority of barge transport used in the U.S.

A southbound export cargo base in non-time-sensitive commodities exists along the Mississippi River trade corridor.³⁹ These commodities include:

- Agricultural commodities such as specialty grains, cotton, and other agricultural products
- Industrial chemicals
- Forest products
- Petrochemical products such as resins and plastics
- Metals

U.S. government national export forecasts project near-term growth in grain and coal exports, leveling off over the next 20 years.⁴⁰ These forecasts indicate that the U.S. will remain the single largest participant in the global grain trade, while U.S. coal producers will continue to hold a marginal position in the global market. Grain producer forecasts predict most exports will be shipped from the central Gulf region around New Orleans, with about one-half of the increase in grain exports transiting the Panama Canal.⁴¹

³⁷ U.S. Army Corps of Engineers, U.S. Port and Inland Waterways Modernization: Preparing for Post-Panamax Vessels, June 20, 2012

³⁸ Swigart, Amdal, Tolford, 2011

³⁹ Ibid, 2011

⁴⁰ USACE, 2012

⁴¹ Ibid, 2012

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The ability to employ larger bulk vessels could potentially lower the delivery cost of U.S. agricultural exports to Asia. This is not likely to have a significant impact on the mix or quantity of total U.S. agricultural or other commodities exported, but it could significantly impact the mix or quantity of commodities moving down the Mississippi River for export at New Orleans.⁴²

The M-55 market analysis projections identified a considerable volume of Ro/Ro and container cargo that could move on the M-55 Marine Highway Corridor. In the container sector, average weekly traffic is projected to reach 1,100 TEU, with the majority of containerized cargo (840 TEU) from grain and the remainder from machinery shipments.⁴³

A bulk carrier is specially designed to transport unpackaged bulk cargo such as grain, coal, ore, and cement. The current trend is to light-load bulk vessels at New Orleans destined for export markets via the Panama Canal,⁴⁴ filling them to less than full capacity due to draft restrictions at the Canal. It is expected that these vessels could be fully loaded after the Panama Canal expansion. Similarly, containers loaded to U.S. highway surface weight restrictions “space out,” reaching the maximum weight before reaching the container’s space capacity.

Relation of commodities to Missouri’s gross State product

The top commodities shipped to and from Missouri by tonnage, according to the 2011 Transearch analysis, align well with the types of commodities conducive to COV transport (**Table J-10**). Farm products (grains), packaged food and kindred products, chemicals and allied products, secondary traffic, and petroleum are all candidates for COV.

Table J-10: Top Missouri Commodities by Tonnage, 2011

STCC2	Commodity	Tons (in thousands)	Share
11	Coal	237,585	23.4%
01	Farm products	129,200	12.7%
14	Nonmetallic minerals	123,662	12.2%
20	Food or kindred products	98,474	9.7%
28	Chemicals or allied products	84,647	8.3%
50	Secondary traffic	83,952	8.3%
29	Petroleum or coal products	47,132	4.6%
46	Miscellaneous mixed shipments	37,592	3.7%
32	Clay, concrete, glass, or stone	31,538	3.1%
37	Transportation equipment	19,410	1.9%
	Remaining commodities	123,557	12.2%
	TOTAL	1,016,748	100.0%

Source: Prepared by CDM Smith, based on TRANSEARCH® data for 2011

⁴² Ibid, 2012

⁴³ RNO Group, 2013

⁴⁴ USACE, 2012

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Outbound truck commodities from Missouri in 2011 totaled 75.3 million tons (15.0 percent of directional movements) via 8.1 million trucks (19.9 percent). They were valued at \$95.0 billion (13.4 percent), with an average value per ton of \$1,262. The top five commodities by tonnage, by trucks, and by value are listed in Table J-11.

Table J-11: Top Missouri Outbound Truck Commodities for 2011

Commodity	Amount	Share of outbound total
BY TONNAGE:		
1 Farm products	17.9 million	23.8%
2 Nonmetallic minerals	14.4 million	19.1%
3 Secondary traffic	11.3 million	14.9%
4 Food or kindred products	10.5 million	14.0%
5 Chemicals or allied products	3.3 million	4.4%
BY UNITS:		
1 Shipping containers	4.2 million trucks	52.1%
2 Farm products	1.1 million trucks	13.6%
3 Secondary traffic	0.6 million trucks	7.7%
4 Nonmetallic minerals	0.6 million trucks	7.3%
5 Food or kindred products	0.5 million trucks	5.7%
BY VALUE:		
1 Transportation equipment	\$19.4 billion	47.9%
2 Miscellaneous mixed shipments	\$11.2 billion	27.7%
3 Chemicals or allied products	\$3.1 billion	7.6%
4 Food or kindred products	\$2.8 billion	6.9%
5 Primary metal products	\$0.7 billion	1.8%

Source: Prepared by CDM Smith, based on TRANSEARCH® data for 2011

Four of the top five outbound truck shipments are shown in brown font; these are suitable for COV transportation. Together they represent about 43 million tons and over 57 percent of the outbound truck tonnage. Even if only a percentage of these are converted to COV, the reduction in traffic congestion and related benefits to Missouri could be noticeable.

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A similar result was found for truck commodities inbound to Missouri in 2011. They total 89.3 million tons (17.8 percent of directional movements) via 7.7 million trucks (19.0 percent), and are valued at \$119.7 billion (16.8 percent), with an average value per ton of \$1,342. The top five commodities based on tonnage, units, and value are shown in **Table J-12**.

Table J-12: Top Missouri Inbound Truck Commodities for 2011

Commodity	Amount	Share of inbound total
BY TONNAGE:		
1 Farm products	20.1 million	22.6%
2 Secondary traffic	14.6 million	16.4%
3 Nonmetallic minerals	13.8 million	15.4%
4 Petroleum or coal products	10.6 million	11.9%
5 Food or kindred products	8.3 million	9.3%
BY UNITS:		
1 Shipping containers	3.2 million trucks	41.2%
2 Farm products	1.2 million trucks	16.0%
3 Secondary traffic	0.8 million trucks	9.8%
4 Nonmetallic minerals	0.6 million trucks	7.3%
5 Petroleum or coal products	0.4 million trucks	5.7%
BY VALUE:		
1 Secondary traffic	\$27.9 billion	23.3%
2 Farm products	\$11.7 billion	9.8%
3 Petroleum or coal products	\$10.9 billion	9.1%
4 Food or kindred products	\$10.0 billion	8.4%
5 Transportation equipment	\$9.9 billion	8.3%

Source: Prepared by CDM Smith, based on TRANSEARCH® data for 2011

Potential impacts on inbound truck traffic are similar to those for outbound truck movements. Inbound truck traffic carrying the potential COV commodities accounts for 53.6 million tons and over 60 percent of the inbound commodities by truck.

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Outbound rail commodities from Missouri in 2011 totaled 21.5 million tons (4.7 percent of directional movements) via 539,145 rail cars (6.6 percent), and were valued at \$40.4 billion (8.7 percent) with an average value per ton of \$1,876. The top five commodities by tonnage, units, and value are shown in **Table J-13**.

Table J-13: Top Missouri Outbound Rail Commodities for 2011

Commodity	Amount	Share of outbound total
BY TONNAGE:		
1 Food or kindred products	5.0 million	23.2%
2 Clay, concrete, glass, or stone	3.1 million	14.6%
3 Farm products	3.1 million	14.2%
4 Miscellaneous mixed shipments	2.3 million	10.5%
5 Waste or scrap materials	2.1 million	9.7%
BY UNITS:		
1 Miscellaneous mixed shipments	173,840 rail cars	32.2%
2 Transportation equipment	115,230 rail cars	21.4%
3 Food or kindred products	70,897 rail cars	13.1%
4 Clay, concrete, glass, or stone	32,596 rail cars	6.0%
5 Farm products	29,810 rail cars	5.5%
BY VALUE:		
1 Transportation equipment	\$19.4 billion	47.9%
2 Miscellaneous mixed shipments	\$11.2 billion	27.7%
3 Chemicals or allied products	\$3.1 billion	7.6%
4 Food or kindred products	\$2.8 billion	6.9%
5 Primary metal products	\$0.7 billion	1.8%

Source: Prepared by CDM Smith, based on TRANSEARCH® data for 2011

The outbound rail commodities that are COV-compatible comprise 10.4 million tons and nearly 48 percent of total outbound rail commodities.

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Inbound rail commodities to Missouri in 2011 totaled 92.3 million tons (20.2 percent of directional movements) via 1.1 million rail cars (13.4 percent), and were valued at \$39.6 billion (8.5 percent) with an average value per ton of \$429. The top five commodities by tonnage, units, and value are shown in **Table J-14**.

Table J-14: Top Missouri Inbound Rail Commodities for 2011

TOP MISSOURI INBOUND RAIL COMMODITIES FOR 2011		
Commodity	Amount	Share of total inbound
BY TONNAGE:		
1 Coal	74.0 million	80.2%
2 Food or kindred products	4.0 million	4.4%
3 Farm products	2.9 million	2.0%
4 Chemicals or allied products	2.9 million	3.1%
5 Transportation equipment	1.9 million	2.1%
BY UNITS:		
1 Coal	619,890 rail cars	56.3%
2 Miscellaneous mixed shipments	150,320 rail cars	13.7%
3 Transportation equipment	103,748 rail cars	9.4%
4 Food or kindred products	46,087 rail cars	4.2%
5 Shipping containers	35,920 rail cars	3.3%
BY VALUE:		
1 Transportation equipment	\$16.0 billion	40.4%
2 Miscellaneous mixed shipments	\$9.2 billion	23.2%
3 Chemicals or allied products	\$3.6 billion	9.0%
4 Coal	\$2.7 billion	6.8%
5 Primary metal products	\$2.2 billion	5.6%

Source: Prepared by CDM Smith, based on TRANSEARCH® data for 2011

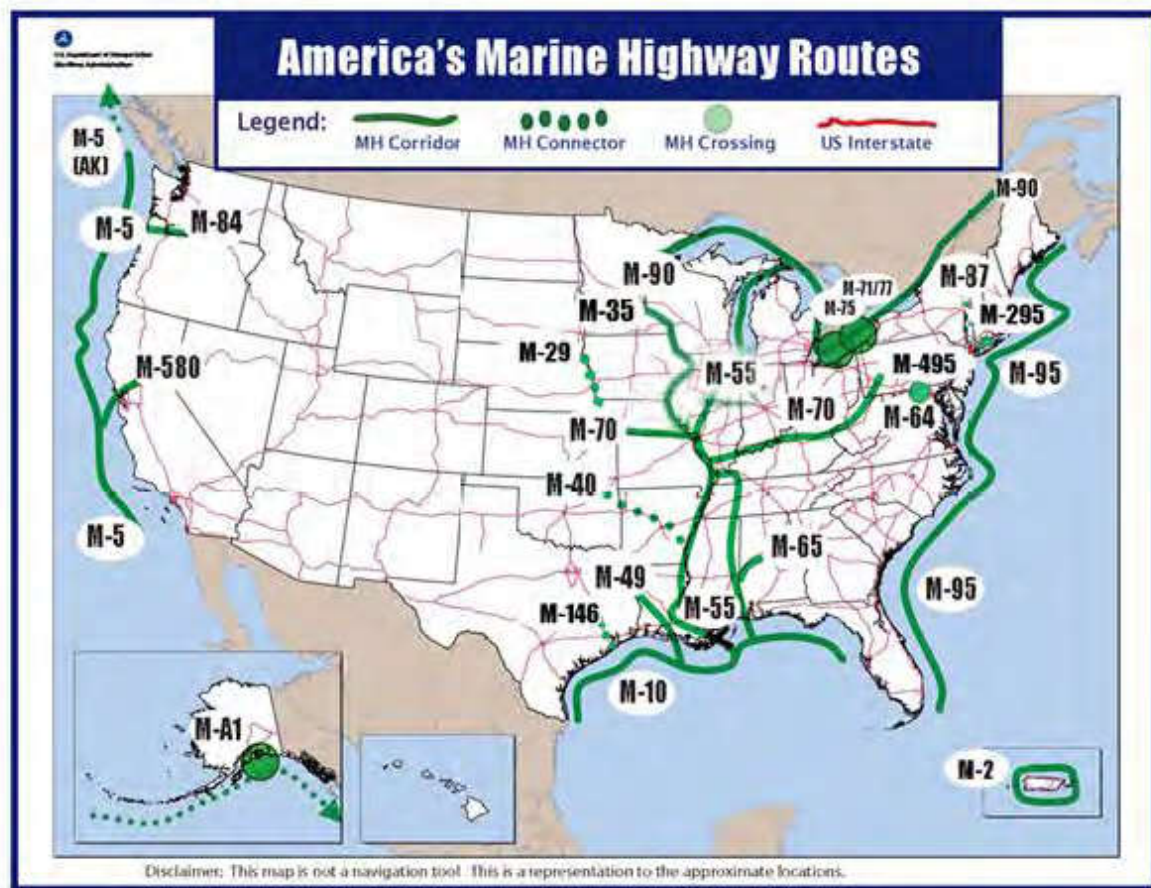
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Strengths, weaknesses, opportunities, and threats analysis

The inland waterways in the U.S. are the most advanced and extensive in the world, greatly aiding in the economic development of the interior of the country. However, the development of this transportation system is lagging that of the other modes and of other countries.

In 2007 Congress directed the U.S. Department of Transportation to implement the America's Marine Highway Program in the Energy Independence and Security Act. This program has the potential, by shifting freight and passenger services to underutilized waterways, to reduce congestion on highways and roads, reduce greenhouse gas emissions, contribute to improvements in safety, and provide additional sealift military resources to support national defense.⁴⁵ This program designated 18 marine highway corridors throughout the United States, and each is named after the congested interstate highway corridor it parallels (Figure J-11).

Figure J-11: America's Marine Highway Routes



Source: www.marad.dot.gov

The RNO Group M-55 Gulf Marine Highway report indicated two key factors for shippers:⁴⁶

Reliability is more important than transit time. Ro/Ro and container cargo movements are typically scheduled to meet defined oceangoing vessel windows at the Gulf Coast ports. Missing these windows is not acceptable to shippers. A hook-n-haul system would increase reliability. Instead of a tow waiting for barges to be unloaded and loaded, the tow would simply drop the barges at the port and hook them onto a barge flotilla that is ready to be shipped. This system reduces the down time of the tow, though it does require additional up-front investments in barges.

⁴⁵ U.S. Dept. of Transportation, Panama Canal Expansion Study Phase 1 Report, November 2013

⁴⁶ RNO Group, 2011

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Service frequencies must be at least every 10 days for Ro/Ro shipments and at least weekly for container cargoes in order to meet the schedules of the respective vessel types loading at Gulf Coast ports.

The Port of Pittsburgh commissioners' report noted container owners and ship lines are very interested in the turnaround time of their equipment, defined as the length of time it takes for the container to reach its destination and return to the point of origin (the deep water port), and "the second shipper concern is the 'one-way traffic' that is sometimes produced by not working both ends of the container shipping business (inbound and outbound)." Barges can also help correct cargo imbalances and reduce one-way traffic by combining container service with conventional bulk commodity transport.

Are there particular conditions on the Mississippi or Missouri Rivers that would benefit COV?

Inland waterway container transport (IWCT) offers an invaluable freight transportation opportunity, but implementing it is inherently challenging for several reasons. In the U.S. IWCT remains very limited, despite years of attempted proof-of-concept initiatives and intermittent federal support.

The lower Mississippi River system is lock- and congestion-free. There are no significant height (air draft) restrictions on the Mississippi waterway, and neither high nor low water level conditions are expected to significantly impact M-55 Marine Highway operations. As container volumes increase at gateway ports, the traditional truck and rail modes of inland transport begin to reach levels that strain the capacity of their supporting infrastructure.⁴⁷

Inland waterway systems that access key markets can provide a high-capacity alternative for longer distance freight transport. COV and barge transportation in general offer capacity and environmental benefits. On a typical 15-barge tow, the Mississippi River can move about 22,500 tons as a single cargo unit, equivalent to 225 railcars or 870 tractor-trailer units.⁴⁸ This additional carrying capacity translates into greater fuel efficiency in ton-miles per gallon. An inland barge tow carries approximately 575 tons every mile per gallon of fuel used, while comparable railroad and truck fuel efficiency are approximately 412 and 155 ton-miles per gallon, respectively.⁴⁹

Reductions in transportation costs due to the Panama Canal expansion could affect the movement of goods through the inland waterways in two ways.⁵⁰ First, a reduction in ocean transportation costs out of Gulf ports due to the use of larger, more efficient bulk ships will tend to reduce the aggregate costs of exporting bulk commodities, such as grain, by the Mississippi River route compared to transport by rail through Pacific Northwest ports. Second, lower transportation costs attributed to expansion of the Panama Canal could increase export volumes as the transportation element of U.S.-produced commodity costs helps make U.S. exports more competitive in world markets.

Are there particular conditions on the Mississippi or Missouri Rivers that would be a significant deterrent to COV? Are any of these conditions port-related?

For COV trade to be successful it must be efficient, reliable, and cost-effective. The upper Mississippi River system has the highest risk of inefficiencies due to the number of locks and dams through which barges must maneuver. This could be detrimental to reliable service and transit times. The reliability of water flow on the Missouri River system is uncertain, as the U.S. Army Corps of Engineers must balance numerous competing uses affecting the overall water flow of the river.

The lower Mississippi River system has potential, but the impediments to further developing these trades are formidable as described in the pre-feasibility study conducted by the Port of Pittsburgh Commission.⁵¹

The chicken and egg syndrome: Container shippers are reluctant to commit cargo for a service that the barge lines do not offer on a predictable, regular, and reliable basis, with point-to-point rates. Barge lines are reluctant to commit barges to a service without the guarantee of sufficient cargo.

Historical perspectives: Previous failed COV attempts have convinced some skeptics that it is impossible to do COV on the Mississippi system, but the failures may have been due to specific business problems. These failed attempts at generating IWCT activity in the U.S. have left shippers and operators uninterested in its potential economic and environmental advantages. The previous attempts on the lower Mississippi were hampered by cut-rate rail competition on an extremely competitive north-south rail network that parallels the Mississippi River; the lack of deep pockets to withstand such competition; the lack of

⁴⁷ USACE, 2011

⁴⁸ U.S. DOT, 2013

⁴⁹ Ibid, 2013

⁵⁰ Ibid, 2013

⁵¹ Port of Pittsburgh Commission, 2003

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experience in dealing with unique container handling requirements; and, for both the upper and lower Mississippi systems, the dependence on single shippers who may change their supply chain logistics requirements for other business reasons.

Complex research and operational organization: Efficiencies of scale indicate 72 TEU containers could be organized and staged together at one time for one destination to minimize time-consuming, multiple stops and possible re-stowage of cargo. Identifying the shippers and organizing the COV service is a complex problem and needs to be done at both ends of the system as well as at other ports that wish to participate. Identifying potential U.S. customers for inland ports will be more difficult than for ocean ports since the utility of Port Import Export Report (PIER) data is less applicable. Identifying potential customers in the Mexican market, where there is less familiarity with barge transportation, will require extensive personal contact.

Terminal requirements: River terminals may need to upgrade key equipment such as spreader bars and container forklifts, as well as technical knowledge of the unique container handling characteristics (estimated cost between \$300,000 and \$1,000,000), in order to initiate service. Some terminals may consider specialized container facilities of 5 to 10 acres with mobile multi-purpose harbor cranes (cost under \$5 million) to optimize efficiency, but no extensive investments are required to start the service. Finally, ensuring terminals along the inland waterways have the equipment, facilities, and technical know-how to handle 20- and 40-foot containers is crucial. Also, a sufficient number of truck chassis must be available to move containers around the port or transport containers off site.

Insurance: Insurance requirements on traditional barge cargo may need to be increased to reflect the high value of containerized cargo. There is also a need to identify the insurance responsibility when handling multiple shippers and multiple shipments on one barge.

Operating a COV service may also present logistical issues:

- The need for easily obtainable, prompt information on barging costs, transit times, and intermodal connections
- The need to identify an entity to oversee the operation, including bookings, scheduling, customer service, and bills of lading; this entity would also be charged with negotiating service contracts with the barge companies and river terminals
- The harbor maintenance tax on cargo value assessed to shippers who use maritime transport; these added costs for IWCT in the U.S. enable other modes to consistently undercut marine shipping's operating costs

According to the National Cooperative Freight Research Program (NCFRP) North American Marine Highways Report, key technical obstacles to success have included a failure to use vessels matched to market needs and an overreliance on too few vessels per operation.⁵² The same report noted that start-up IWCT shippers have been unable to access the types of vessels and barges needed to develop cost-effective service, such as several smaller vessels for low-volume, high-frequency service, due to their high cost and low availability. This problem is partially attributable to the Jones Act, which requires all domestic vessels to be built in the United States and crewed by U.S. mariners. As a result, the service and reliability of start-ups who are dependent on one or a few vessels are seriously impacted when problems arise. Other weaknesses of inland barge transport are high start-up costs and related lack of service flexibility and accessibility. Finally, although the NCFRP report found that port infrastructure issues were not a serious deterrent to IWCT, some river terminals may need expensive equipment upgrades to efficiently handle container service.

The existing Missouri ports near the St. Louis area are landlocked, with limited expansion opportunities. Investing in a new port within the St. Louis catchment area is an option, but it would require significant investment. A new port allows the site to be tailored to COV operations in the most efficient way.

Could COV support economic opportunity for Missouri and, if so, what might those opportunities include?

Due to the limited expansion opportunities at the existing Missouri ports near St. Louis, the State should consider developing a new port to take advantage of future COV opportunities. The development of a new Jefferson County port focused on warehousing and distribution is estimated to create economic activity in the State through economic output and wages of approximately \$1 billion and over 6,000 construction and operational jobs,⁵³ including local, regional, and state multiplier impacts. Realizing these benefits would require a significant investment.

⁵² C. Kruse and N. Hutson, North American Marine Highways: NCHRP Report 5. Transportation Research Board, 2010

⁵³ Jefferson County Port Authority, Phase 1 Feasibility Analysis, January 2010

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Does COV pose a threat to Missouri if it is not a mode that can be used within the state?

The University of New Orleans Transportation Institute conducted a high-level investigation of conceptual and actual gateway and inland terminal sites along the lower and upper sections of the Mississippi River that could contribute to the development and or expansion of IWCT.⁵⁴ The gateway and inland terminal sites were then compared based on a number of factors and were categorized as either gateway or inland port facilities. For the purposes of the study, an inland port was defined as a facility located in close proximity to inland distribution centers or large consumption markets.

The following factors were used to determine the suitability of inland ports:

- Location outside the lock system
- Intermodal connectivity for reaching major consumption markets
- Proximity (within 15 miles) to major highways, rail ramps, and distribution facilities
- Minimum 0.25 acres of ground storage per TEU handled
- Available acreage for value-added activities such as warehousing, stuffing and stripping facilities, and container maintenance and repair
- Amount of new infrastructure construction needed

The above report identified two inland port locations that met all of these criteria: Fullen Dock in Memphis, Tennessee and America's Central Port in Granite City, Illinois (**Figure J-11**).

Figure J-11: America's Central Port in Granite City, Illinois



Source: Tri-City Regional Port

The report also stated the existing Missouri ports were landlocked and not suitable for expansion. Missouri will face competition from the established Memphis port and from America's Central Port in Granite City, Illinois, which was awarded TIGER grant funding in 2011 to construct a new harbor.

The Missouri location downstream of Lock and Dam 27 (the southernmost lock and dam) that could tap into the St. Louis economy and its economic activity base is the undeveloped Jefferson County port. The realization of a Jefferson County port moved forward with a 2010 Phase 1 Feasibility Study that examined four potential sites. The study examined two development scenarios, a heavy rail-dependent port and a focused warehousing and distribution port. The latter is more conducive to future COV activity.

What could container-on-vessel mean for Missouri businesses in the future?

Regardless of the COV operations on the Mississippi River, Missouri farmers and export shippers of grains and bulk materials through the Panama Canal should see a reduction in shipping cost as the light loading of ocean vessels due to existing Panama Canal berthing requirements is no longer necessary. These reduced costs will make COV more competitive with other modes

⁵⁴ Swigart, Amdal, Tolford, 2011

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of transportation to and from the Gulf Coast ports. Some inbound containers are also light loaded to meet highway weight limitations. COV on the Mississippi River could instantly reduce costs for some shipments by enabling shippers to take advantage of a container's full volume capacity without having to meet the more restrictive highway weight limits. In both instances, transportation cost savings would be realized.

All Missourians will benefit from reduced congestion, more fuel efficient transportation of goods, and related improvements in operating and air quality costs on the highways and rail lines within the state if future shipments can be diverted to COV services.

The decision to invest in the future of COV in Missouri is a tricky one; possible scenarios are listed below (**Table J-15**).

Table J-15: Potential Scenarios Regarding COB Implementation

	Missouri does not invest in port COV opportunities	Missouri invests in port COV opportunities
Inland waterway COV volumes meet or exceed projections	<ul style="list-style-type: none"> • Potential tangent benefits from Granite City, IL COV port • Missed opportunity 	<ul style="list-style-type: none"> • Job opportunities in construction, transportation, and trade • Economic growth
Inland waterways COV volumes do not meet projections	<ul style="list-style-type: none"> • Continue the status quo • Nothing ventured, nothing lost 	<ul style="list-style-type: none"> • Lost resource investment in landside equipment • Public perception of misallocated funding resources

Key findings and conclusions

Missouri must overcome a number of challenges if it is to develop a COV service in the State. The following findings related to the world trade market merit consideration.⁵⁵

- World trade and U.S. trade are expected to continue to grow, and larger post-Panamax vessels will call in increasing numbers at U.S. ports that can accommodate them.
- Along the Southeast and Gulf Coasts there may be opportunities for economically-justified port expansion projects to accommodate these post-Panamax vessels.
- Potential transportation cost savings resulting from using post-Panamax size vessels to ship agricultural products to Asia through the Panama Canal may lead to an increase in grain traffic on the Mississippi River for export at Gulf ports. An analysis indicated the current Mississippi River capacity is adequate to meet potential demand if the waterways serving the agricultural export market are maintained.
- The primary challenge with the current process for delivering navigation improvements is to ensure adequate and timely funding to take advantage of potential opportunities.

According to the RNO Group report, the findings and conclusions listed below apply to Missouri's potential involvement in COV on the Mississippi River. These findings are related to the opportunities and challenges facing COV on the Mississippi River system.⁵⁶

- **The M-55 initiative produces positive financial results:** The results for Ro/Ro and container services are mixed. While all of the services, both individually and combined, are able to produce positive financial earnings, only the

⁵⁵ USACE, 2012

⁵⁶ RNO Group, 2013

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Ro/Ro service produces convincingly favorable earnings due to its 50 percent operating margins. The container services have operating margins between three percent and six percent, and these are not convincingly favorable.

- **Risks associated with startup are significant:** Gradual market penetration associated with startup severely jeopardizes the viability of the container services, while strong earnings and cash flow associated with the Ro/Ro service allow it to remain buoyant through startup.
- **Working capital funding is needed:** All of the services will need working capital to make it through startup. The Ro/Ro service will need approximately \$2.5 million, while the two container services combined will require \$12 million. The payback risk on the Ro/Ro service is manageable.
- **Ro/Ro service is financially viable:** Implementing the Ro/Ro service presents a significant business opportunity. It would serve a captive market that is currently facing excessively high prices. Moreover, the customer is interested in reducing costs and increasing mode options.
- **Container services require significant support:** The container services can only be viewed as viable if any combination of the following occurs: ocean shipping rates to the Gulf Coast become more comparable to those for the West Coast, the container services are launched by the Ro/Ro operator after about a year of operation, or funding is subsidized up to \$12 million.
- **Hook-n-haul reduces earnings and increases working capital requirements:** The results of this business philosophy indicate that, in the absence of faster Marine Highway vessels, hook-n-haul is essential to meet clients' service expectations.

Resources

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